Appeal of provisions for Demand Responsive Controls

in the

2024 draft International Energy Conservation Code

Commercial and Residential

Building Owners and Managers Association International

and the

National Multifamily Housing Council

December 2023

Specific description of the issue being appealed:

The 2024 International Energy Conservation Code – Residential (IECC-R) mandates the provision of demand responsive (DR) controls for certain service water heating equipment and the International Energy Conservation Code– Commercial (IECC-C) mandates the provision of DR controls for equipment for HVAC space conditioning, service water heating, and lighting, regardless of whether these controls can even function as intended. These requirements violate the core intent of the IECC to provide *"minimum efficiency requirements for buildings that result in the maximum level of energy efficiency that is safe, technologically feasible, and life cycle cost effective, considering economic feasibility, including potential costs and savings for consumers and building owners, and return on investment."*

Further, to the extent that the IECC knowingly requires controls equipment that cannot be used to provide the desired controls, the scope of the IECC is violated. The scope of the ICC is applicable to the design and construction of buildings. Per the definition of "*building*," in Section C202, mechanical and electrical equipment within the scope of the IECC must support the building. Such controls equipment that cannot be used for the intended control does not support the building and therefore is out-of-scope of the IECC.

Statement describing precisely why the issue is being appealed:

The DOE Energy Information Administration tracks utilities that provide demand response (DR) programs.[1] Data from 2022 indicates that of 336 electric utilities, 100 did not have any residential customers enrolled in a DR program, and 131 have no commercial customers enrolled, indicating no such program exists.

Re-stated, nearly one-third of electric utilities evidently do not offer DR programs. In these jurisdictions a requirement for DR controls for HVAC, lighting, or service water heating equipment is a requirement for a building owner to provide and install devices and equipment which cannot function as intended. According to PNNL, for residential buildings, *" … the incremental cost of upgrading from a standard programmable thermostat to a smart thermostat with DR controls is anywhere between $100 and $200."*[2] In a 200-unit apartment or condominium building, where no DR program exists, $20,000 to $40,000 would be wasted on DR HVAC controls required by the 2024 IECC.

For DR lighting controls, homewyse estimates a cost range of $6,927 to $8,396.[3] For DR controls for water heating PNNL says, *the most straightforward way to implement the CTA-2045 communication for DR control is to switch to an HPWH* (Heat Pump Water Heater) *with an incremental cost of $975*.[4] PNNL advocates HPWHs in part because, *"Electric resistance water heaters supplied with CTA-2045 communication have been manufactured but are not widely available."*

Aside from the question of whether a requirement for specific water heater controls creates a Federal preemption violation, adding nearly $1,000 of cost for water heater DR controls, and $7,000+ for lighting DR controls, to a dwelling unit **where no utility DR program exists** clearly violates the intent of the IECC to provide "*minimum efficiency requirements for buildings*."

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[1] https://www.eia.gov/electricity/data/eia861/ (Site has a year 2022 zip folder download with an included Demand Response spreadsheet)

[2] https://www.energycodes.gov/sites/default/files/2021-10/TechBrief_GEB_Oct2021.pdf

[3] https://www.homewyse.com/services/cost_to_design_and_install_lighting_control_system.html

[4] PNNL. See footnote 2, page 6.

Similarly, a further intent of the IECC (both residential and commercial) is to provide requirements *"that result in the maximum level of energy efficiency that is safe, technologically feasible, and life cycle cost effective, considering economic feasibility, including potential costs and savings for consumers and building owners, and return on investment."* Equipment that cannot be used as intended does not support the building, provides no return on investment, and therefore cannot be life cycle cost effective. Requiring such equipment violates the scope and intent of the IECC.

Most egregiously, there is also no need for the IECC to require DR controls in jurisdictions where DR programs **do** exist because the electric utilities (EUs) serving those jurisdictions, (more than 66 percent of the EUs), typically use incentives to pay building owners to install and use DR controls. The EUs compensate building owners for the installation and use of DR controls because it benefits the EUs' businesses. DR controls are primarily intended to manage electric grid operations; they directly benefit EU operators, allowing them to manage demand, pricing, and costs.

Note that where DR programs are offered by the local EU, customers only join on a voluntary basis. For the remaining owners in that EU's service area - those that do not want to participate in a DR program - a code mandate to have DR controls provides no benefit and is an unnecessary cost.

Importantly, where a DR program exists and a customer later decides to participate in the program, it is a simple matter to change a thermostat and, when replacing a water heater in the future, to opt for a DR capable unit. In this way owners are responsible for the decisions regarding the "*economic feasibility, including potential costs and savings"* of their equipment choices rather than having an IECC consensus committee at arm's length from the circumstance make that decision.

A general purpose of the ICC is the *"the lessening of burdens of government through the development, maintenance and publication of model statutes and standards for the use by federal, state and local governments in connection with the administration of building laws and regulations."*[5] Federal, state, and local government burdens are not lessened by using the IECC to end-run local fiscal policy and regulation of EUs.

In keeping with the ICC's bylaws, no part of the intent of the IECC says it is to be used to serve as a policy to transfer assets from owners to electric providers and this appeal should be sustained.

Incorporation of requirements in the IECC that violate the scope and intent of the IECC represent a material and significant irregularity of process.

Detailed description of how the issue being appealed will adversely affect the appellant:

The National Multifamily Housing Council (NMHC) provides a voice for America's apartment industry. Our membership is engaged in all aspects of the apartment industry, including ownership, development, management, and finance. NMHC represents the principal officers of the apartment industry's largest and most prominent firms.

The Building Owners and Managers Association (BOMA) International is the leading trade association for commercial real estate professionals for more than 100 years. It represents the owners, managers, service

[5] https://www.iccsafe.org/wp-content/uploads/ICC-Bylaws-December-10-2021-Certified.pdf

providers and other property professionals of all commercial building types, including office, industrial, medical, corporate, and mixed-use. BOMA International is the voice of commercial building owners and operators.

According to recent research commissioned by NMHC, the U.S. needs to build 4.3 million new apartment homes by 2035 to meet the demand for rental housing.[6] This includes an existing shortage of 600,000 apartments stemming from underbuilding due in large part to the 2008 financial crisis. Further, underproduction of housing has translated to higher housing costs – resulting in a consequential loss of affordable housing units (those with rents less than $1,000 per month), with a decline of 4.7 million affordable apartments from 2015-2020.

In fact, the total share of cost-burdened apartment households (those paying more than 30% of their income on housing) has increased steadily over several decades and reached 57.6% in 2021.[7] During this same period, the total share of *severely* cost-burdened apartment households (those paying more than half their income on housing) increased from 20.9 to 31.0%.[8]

Further, the Biden Administration has recognized this immense need to bolster the nation's housing production and outlined a strategy to improve housing supply conditions through the *Housing Supply Action Plan*. The plan underscores that this national supply shortfall "*burdens family budgets, drives up inflation, limits economic growth, maintains residential segregation, and exacerbates climate change*."[9] And that *"[r]ising housing costs have burdened families of all incomes, with a particular impact on low- and moderate-income families, and people and communities of color."*[10]

It is becoming increasingly difficult to build housing that is affordable to a wide range of income levels. Ongoing materials and equipment shortages and strained supply chain conditions pressures housing development and results in costs and delays that impact overall affordability and availability. In addition, ill-timed, unnecessary, or unduly burdensome laws, policies, and regulations – such as requirements to provide DR controls where no DR program exists - prevent us from delivering the housing our country so desperately needs. Elevated regulatory costs, particularly, create a barrier to affordable housing supply. Recent research published by NMHC and the National Association of Home Builders found that regulation imposed by all levels of government accounts for 40.6 percent of multifamily development costs.[11]

Following extreme, pandemic-fueled volatility in product costs, supply chain stability, and staffing constraints, the apartment construction and renovation pipeline has seen some moderation yet continues to face difficult conditions. Construction delays are prevalent – with 88 percent of respondents reporting delays in NMHC's September 2023 Quarterly Survey of Apartment Construction and Development Activity. Further, 48 percent of respondents reported experiencing repricing increases in projects over the last three months. Respondents experiencing delayed starts cited a range of causes including lack of construction financing and project infeasibility, while the availability of necessary products and materials,

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[6] Hoyt Advisory Services, "Estimating the Total U.S. Demand for Rental Housing by 2035." (2022), https://www.weareapartments.org/
[7] American Housing Survey, U.S. Census Bureau, "NMHC tabulations of 1985 American Housing Survey microdata." (2021).
[8] *Id.*
[9] "President Biden Announces New Actions to Ease the Burden of Housing Costs." (May 16, 2022) https://www.whitehouse.gov/briefing-room/statements-releases/2022/05/16/president-biden-announces-new-actions-to-ease-the-burden-of-housing-costs/
[10] *Id.*
[11] National Multifamily Housing Councill and National Association of Home Builders, "Regulation: 40.6 Percent of the Cost of Multifamily Development." (2022) https://www.nmhc.org/globalassets/research--insight/research-reports/cost-of-regulations/2022-nahb-nmhc-cost-of-regulations-report.pdf

or lack thereof, saw the largest increase in responses, with 30 percent of respondents citing materials sourcing and delivery challenges as a contributing factor to delayed starts (up from 10 percent in the previous quarter).

Apartment builders and developers also continue to be impacted by escalations in materials costs. The prices of a myriad of essential building products and equipment continue to rise, with respondents reporting a 7% average increase in residential appliance costs over a three-month period. A sizeable portion of respondents further reported relying on alternative brands or suppliers to mitigate price increases and supply shortages for appliances (58%).

Adding DR equipment and devices mandated by the IECC to already constrained supply chains fundamentally reduces the ability of NMHC members to meet the nation's housing needs and BOMA International members to meet the changing, post-pandemic needs of commercial building inventories.

Statement indicating the requested remedial action:

NMHC and BOMA International request that all provisions mandating DR controls be deleted from the IECC for failure to comply with the respective scopes and intents of the IECC-R and IECC-C. Those requirements are in the following sections:

- IECC-R Section R403.5.5 Demand responsive water heating
- IECC-C Sections C403.4.6 Demand responsive controls, C404.10 Demand responsive water heating, and C405.2.8 Demand responsive lighting controls

NMHC and BOMA International are not requesting that owner selectable DR requirements in IECC-R Section R408 or IECC-C Section C406 be deleted. These are optional requirements and provide an incentive for owners to join a DR program where such program exists.

NMHC and BOMA International are also not opposed to "*optional supplemental requirements*" for DR controls being placed in adoptable appendices as permitted by the respective intents of the IECC-R and IECC-C. Presumably local governments will only adopt such an appendix where the local EU offers a DR program and required controls can work as intended.

Alternatively, if DR requirements are found by the appeals board to comply with the respective intents of the IECC-R and IECC-C to potentially *"include nonmandatory appendices incorporating additional energy efficiency and greenhouse gas reduction resources developed by the Code Council and others,"* NMHC and BOMA International request that all provisions currently mandating provision of DR controls be placed in nonmandatory language appendices of the applicable codes. In accordance with the direction provided by ICC's February 15, 2022 memorandum,[12] nonmandatory appendices are informational and not adoptable, meaning such appendices are drafted in nonmandatory language.

[12] https://www.iccsafe.org/wp-content/uploads/IECC-Discount-Rates-and-Code-Content-Memorandum_02_15.22.pdf

The names and mailing addresses of individuals and organizations that may have an interest in or be affected by the matter being appealed:

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Utility Characteristics					Yearly Energy and Demand Savings																					Program Costs										DSM Program
					Number of Customers Enrolled					Energy Savings (MWh)					Potential Peak Demand Savings (MW)					Actual Peak Demand Savings (MW)					Customer Incentives (Thousand Dollars)					All Other Costs (Thousand Dollars)					Grid Connected
Data Year	Utility Number	Utility Name	State	BA Code	Residential	Commercial	Industrial	Transportation	Total	Residential	Commercial	Industrial	Transportation	Total	Residential	Commercial	Industrial	Transportation	Total	Residential	Commercial	Industrial	Transportation	Total	Residential	Commercial	Industrial	Transportation	Total	Residential	Commercial	Industrial	Transportation	Total	Water Heater
2022	162	Aiken Electric Coop Inc	SC	SC	308	0	0	0	308	4	0	0	0	4	0.2	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.2	15	0	0	0	15	0	0	0	0	0	288
2022	189	PowerSouth Energy Cooperative	AL	SOCO	20,374				20,374	0				0	18.0				18.0	18.0				18.0	0				0	147				147	476
2022	195	Alabama Power Co	AL	SOCO	4,781	5	32		4,818	144	1	2,336		2,481	142.3	4.4	1,404.4		1,551.1	49.9	4.0	292.0		345.9	130	100	28,667		28,896	940	143	428		1,510	
2022	207	Alameda Municipal Power	CA	CISO	32,146	4,231			36,377																										
2022	213	Alaska Electric Light & Power Co.	AK	NA	2,254	27			2,281						5.0	13.0			18.0						63	1			64	0	0			0	
2022	295	City of Alexandria - (MN)	MN	MISO	2,817				2,817						9.0				9.0	3.7				3.7	0				0	55				55	
2022	332	Allegheny Electric Coop Inc	PA	PJM	42,567				42,567						42.4				42.4	42.4				42.4						2,879				2,879	1
2022	407	Altamaha Electric Member Corp	GA	SOCO			231		231			25		25			16.0		16.0			10.0		10.0											
2022	554	City of Ames - (IA)	IA	MISO	10,956	169	1	0	11,126	0	0	0	0	0	3.2	0.1	2.0	0.0	5.2	3.2	0.1	0.0	0.0	3.2	220	8	21	0	249	0	0	0	0	0	
2022	590	City of Anaheim - (CA)	CA	CISO	468	13			481	6				6		25.6			25.6						11				11						
2022	733	Appalachian Power Co	VA	PJM	4,821	0	1	0	4,822	190	0	0	0	190	5.8	0.0	17.0	0.0	22.8	5.6	0.0	0.0	0.0	5.6	258	0	0	0	258	410	0	0	0	410	0
2022	733	Appalachian Power Co	WV	PJM	122	0	4	0	126	15	0	0	0	15	1.5	0.0	51.2	0.0	52.7	1.5	0.0	0.0	0.0	1.5	89	0	0	0	89	286	0	0	0	286	0
2022	803	Arizona Public Service Co	AZ	AZPS	803,727	323	0	0	804,050	774,947	37,868		0	812,815	228.8	38.0	0.0	0.0	266.8	228.8	38.0	0.0	0.0	266.8	2,086	0	0	0	2,086	3,999	1,304	0	0	5,302	406
2022	807	Arkansas Electric Coop Corp	AR	MISO			8		8								628.0		628.0								30,046		30,046						
2022	814	Entergy Arkansas LLC	AR	MISO	17,419	152	1,861		19,432	1,866	1,019	1,112		3,997	18.8		449.7		468.5	18.8		21.8		40.6	233	1,211	378		1,822	731	3,498	3,164		7,393	
2022	1009	City of Austin - (MN)	MN	MISO	6,852	2			6,854	111	2			113	3.9	0.4			4.3	3.9	0.4			4.3	0	19			19	275	0			275	
2022	1015	Austin Energy	TX	ERCO	87,411	4,393	1,464		93,268	621	926	309		1,856	101.2	3.9	1.3		106.4	47.7	3.3	1.1		52.0	1,366	772	257		2,395	643	696	232		1,572	0
2022	1167	Baltimore Gas & Electric Co	MD	PJM	851,307	0	0	0	851,307	76	0	0		76	351.7	0.0	0.0	0.0	351.7	0.0	0.0	0.0	0.0	0.0	22,195	0	0	0	22,195	8,717	0	0	0	8,717	
2022	1251	Barron Electric Coop	WI	MISO	5,839	216		0	6,055	0	0	0	0	0	9.1	3.9	0.0	0.0	13.0	3.7	1.6	0.0	0.0	5.3	23	1	0	0	24	79	3	0	0	82	11
2022	1529	Beltrami Electric Coop, Inc	MN	MISO	7,325	199			7,524	3	76			79	231.2	6.3			237.5	24.7	0.7			25.3	117	3			120	437	12			449	
2022	1613	Berkeley Electric Coop Inc	SC	SC	370				370	0				0	0.3				0.3	0.3				0.3	19				19	93				93	
2022	1769	Black Hills Electric Coop, Inc	SD	SWPP	540	24	0	0	564	5	1	0	0	6	1.2	0.2	0.0	0.0	1.4	0.6	0.2	0.0	0.0	0.9	0	0	0	0	0	6	1	0	0	6	79
2022	1889	Blue Ridge Elec Member Corp - (NC)	NC	DUK	39,408				39,408	2				2	2.3				2.3	2.2				2.2	23				23						
2022	2678	C & L Electric Coop Corp	AR	MISO		48			48							1.2			1.2		1.1			1.1		19			19						
2022	2985	Capital Electric Coop, Inc	ND	SWPP	6,997	13	17		7,027						12.9	4.9	1.3		19.0	10.2	4.8	1.3		16.4	154	51	57		262	76	1	1		78	109
2022	3046	Duke Energy Progress - (NC)	NC	CPLE	204,473	173			204,646						19.7	41.1			60.8	0.0	0.0			0.0	6,150	2,012			8,162	7,219	988			8,207	
2022	3046	Duke Energy Progress - (NC)	SC	CPLE	17,102	22			17,124						0.9	83.5			84.4	0.0	0.0			0.0	890	291			1,181	1,044	143			1,187	
2022	3107	Carteret-Craven El Member Corp	NC	CPLE	741	38			779	417	605			1,022	0.3	2.1			2.4	0.0	0.2			0.2	0	0			0	0	0			0	400
2022	3203	Cedar Falls Utilities	IA	MISO		2			2		794			794		12.7			12.7		0.0			0.0		402			402		1			1	
2022	3205	Cedar-Knox Public Power Dist	NE	SWPP			747		747								45.8		45.8			28.7		28.7								128		128	
2022	3222	Central Alabama Electric Coop	AL	SOCO	154				154	164				164	0.3				0.3	0.3				0.3						15				15	
2022	3248	Central Georgia El Member Corp	GA	SOCO	4,841				4,841	192				192	7.0				7.0	4.0				4.0	68				68	198				198	3
2022	3249	Central Hudson Gas & Elec Corp	NY	NYIS	2,746	8	6		2,760	12	1	3		17	3.8	1.7	3.8		9.2	3.8	1.3	3.1		8.2											
2022	3278	AEP Texas Central Company	TX	ERCO		68			68		19			19		28.4			28.4		19.4			19.4		500			500		54			54	
2022	3279	Central Power Elec Coop, Inc	ND	SWPP						2,796	561			3,357	13.4	1.4			14.8	13.4	1.4			14.8	294	353	27		674						
2022	3502	Choctawhatchee Elec Coop, Inc	FL	SOCO	52,816	7,595	2	0	60,413	0	0	0	0	0	19.9	2.8	0.0	0.0	22.7	19.9	2.8	0.0	0.0	22.7	23	0	0	0	23	8	1	0	0	9	
2022	3503	Choptank Electric Cooperative, Inc	MD	PJM		9		0	9							2.1			2.1		1.2		0.0	1.2		3			3			1			
2022	3755	Cleveland Electric Illum Co	OH	PJM	0	0	4	0	4	0	0	0	0	0	0.0	0.0	189.7	0.0	189.7	0.0	0.0	189.7	0.0	189.7	0	0	7,836	0	7,836	0	0	0	0	0	
2022	3757	Clay Electric Cooperative, Inc	FL	SEC		7			7							18.3			18.3		18.3			18.3		200			200		260			260	
2022	3931	Coles-Moultrie Electric Coop	IL	MISO	4,299	146	6		4,451						3.0	8.0	3.0		14.0																
2022	3989	City of Colorado Springs - (CO)	CO	WACM	4,937		1	0	4,938	0		0		0	2.9		14.2		17.1	2.9		0.0		2.9	298		2,301		2,598	151		0		151	
2022	4065	City of Columbus - (OH)	OH	PJM			11		11								13.4		13.4			7.7		7.7											
2022	4110	Commonwealth Edison Co	IL	PJM	419,616	2,359	612	0	422,587	232	0	0	0	232	120.0	407.0	525.0	0.0	1,052.0	120.0	0.0	0.0	0.0	120.0	3,058	0	0	0	3,058	4,708	339	338	0	5,385	0
2022	4176	Connecticut Light & Power Co	CT	ISNE	20,134	229	107		20,470						35.1	41.1	54.3		130.5	21.8	26.6	36.7		85.1	1,597	1,460	2,016		5,073	1,598	141	195		1,934	0
2022	4226	Consolidated Edison Co-NY Inc	NY	NYIS	37,026	3,070			40,096	503	7,438			7,941	31.3	365.1			396.4	27.7	309.9			337.7	1,209	30,680			31,889	825	770			1,595	
2022	4254	Consumers Energy Co	MI	MISO	249,350	1,125	16		250,491	700	0	15		714	121.1	268.9	238.2		628.2	94.4	0.4	14.5		109.3	3,622	5,984	18,103		27,709	27,858	14,682			42,540	
2022	4295	Comanche County Elec Coop Assn	TX	ERCO		10			10							1.9			1.9		0.6			0.6		30			30						
2022	4363	Corn Belt Power Coop	IA	SWPP	5,352		4		5,356						42.2		44.2		86.4	38.3		44.2		82.5											887
2022	4430	Covington Electric Coop, Inc	AL	SOCO	2,539				2,539						0.3				0.3	0.2				0.2	12				12						33
2022	4432	Coweta-Fayette El Member Corp	GA	SOCO	1,692				1,692	0				0	15.0				15.0	8.0				8.0	13				13						
2022	4509	Craighead Electric Coop Corp	AR	MISO		711	1		712		23	1		24		10.0	1.2		11.2												732	30		762	
2022	4538	Crisp County Power Comm	GA	SOCO			2		2								12.0		12.0			10.0		10.0			0		0			0		0	
2022	4675	Cuivre River Electric Coop Inc	MO	AECI	0	7			7	0	0			0	0.0	6.3			6.3	0.0	5.6			5.6	0	0			0	0	0			0	
2022	4911	Dawson Power District	NE	SWPP			4,747		4,747								113.4		113.4			111.5		111.5								141		141	
2022	5027	Delmarva Power	DE	PJM	189,192	1,911	0	0	191,103	451	4	0	0	455	112.3	0.7	0.0	0.0	113.0	112.3	0.7	0.0	0.0	113.0	0	0	0	0	0	1,381	14	0	0	1,395	
2022	5027	Delmarva Power	MD	PJM	113,680	2,840	0	0	116,520	282	26	0	0	308	77.7	4.7	0.0	0.0	82.4	77.7	4.7	0.0	0.0	82.4	1,791	12	0	0	1,803	1,370	336	0	0	1,706	
2022	5070	Delaware Electric Cooperative	DE	PJM	27,449	1,169	0	0	28,618	0	0	0	0	0	13.8	23.9	0.0	0.0	37.7	13.5	18.5	0.0	0.0	32.0	559	4	0	0	563	56	2	0	0	58	
2022	5078	Denton County Elec Coop, Inc	TX	ERCO	12,137				12,137	121				121	29.7				29.7	11.0				11.0	485				485	512				512	
2022	5109	DTE Electric Company	MI	MISO	333,307	1,757	364		335,428	395	27	134		556	261.0	39.0	512.0		812.0						703	274	544		1,521	10,715				10,715	
2022	5202	Dixie Electric Membership Corp	LA	MISO	9,705				9,705	2,635				2,635	67.9				67.9						583				583						
2022	5335	City of Dover - (DE)	DE	PJM		2	2		4		2	5		8		12.6	38.5		51.1							14	43		57						
2022	5336	City of Dover - (OH)	OH	PJM			6		6			1		1			2.7		2.7			2.6		2.6			16		16						
2022	5416	Duke Energy Carolinas, LLC	NC	DUK	217,467	5,288			222,755						409.7	388.4			798.1						6,838	12,197			19,035	6,170	2,516			8,686	
2022	5416	Duke Energy Carolinas, LLC	SC	DUK	70,173	1,294			71,467						129.0	132.0			261.0						2,528	4,510			7,038	2,031	647			2,678	
2022	5417	Dunn County Electric Coop	WI	MISO	3,197	349			3,546						1.7	22.8			24.5	0.4	5.9			6.3	410	45			455	126	14			140	9
2022	5480	Town of Danvers	MA	ISNE	72	9	0	0	81	1	2	0	0	4	0.8	2.8	0.0	0.0	3.5	0.3	0.4	0.0	0.0	0.7	6	5	0	0	11	10	3	0	0	14	
2022	5552	East River Elec Pwr Coop, Inc	SD	SWPP											56.8	2.8	11.4	0.0	71.0	56.8	2.8	11.4	0.0	71.0	2	0	0	0	2	504	179	27	0	710	958
2022	5580	East Kentucky Power Coop, Inc	KY	PJM	3,684	0	18	0	3,702	18	0	0	0	18	5.9	0.0	325.9	0.0	331.8	5.9	0.0	0.0	0.0	5.9	738	5.0	16,973	0	17,711	1,189	0	0	0	1,189	0
2022	5701	El Paso Electric Co	NM	EPE	2,200	2	0	0	2,202	286	12	0	0	298	2.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0		2.0	96	13	0	0	109	295	124	0	0	419	
2022	5701	El Paso Electric Co	TX	EPE	10,419	6	5	0	10,430	479	31	30	0	540	8.0	4.0	4.0	0.0	16.0	8.0	4.0	4.0	0.0	16.0	275	151	169	0	595	146	12	11	0	169	
2022	5773	City of Elk River	MN	MISO		8			8							18.1			18.1		16.0			16.0											
2022	5780	Elkhorn Rural Public Pwr Dist	NE	SWPP			1,496		1,496			775		775			53.8		53.8			51.2		51.2								227		227	227
2022	5880	Energy Coop of New York, Inc	NY	NYIS		2			2							1.9			1.9		1.9			1.9											
2022	5905	Excelsior Electric Member Corp	GA	SOCO			228		228			112		112			9.0		9.0			2.2		2.2					0			47		47	
2022	6181	Farmers Electric Coop, Inc - (MO)	MO	AECI	8,339	35	1		8,375	166	0			167	0.4	0.0			0.5	0.3	0.0			0.4						4	0			4	
2022	6182	Farmers Electric Coop, Inc - (TX)	TX	ERCO	1,510	0	0	0	1,510	84	0	0	0	84	3.1	0.0	0.0	0.0	3.1	2.6	0.0	0.0	0.0	2.6	122	0	0	0	122	71	0	0	0	71	
2022	6235	Fayetteville Public Works Commission	NC	CPLE	330	34	1		365						2.0		8.0		10.0	0.8		8.0		8.8	2	2	0		4	0	0	0		0	
2022	6342	First Electric Coop Corp	AR	MISO	6,031	0	555	0	6,586	39	0	904	0	943	6.0	0.0	68.5	0.0	74.6	1.0	0.0	13.2	0.0	14.2	165	0	5,158	0	5,323						
2022	6374	Fitchburg Gas & Elec Light Co	MA	ISNE	154	3			157	0	0			0	0.1	0.3			0.4	0.1	0.3			0.4	5	15			20	24	18			42	
2022	6395	Flathead Electric Coop Inc	MT	BPAT	2,889				2,889						28.8				28.8	21.5				21.5	141				141	10				10	
2022	6411	Flint Electric Membership Corp	GA	SOCO	19,056		623		19,679	146		284		430	17.9		34.9		52.8	2.0		8.0		10.0	271		135		405	123		7		130	
2022	6452	Florida Power & Light Co	FL	FPL	677,825	19,164			696,989	727	7,256			7,983	761.3	853.0			1,614.3						27,928	69,524			97,452	13,101	1,625			14,726	
2022	6455	Duke Energy Florida, LLC	FL	FPC	433,579	263	86		433,928						370.0	144.0	305.0		819.0	0.0	0.0	0.0		0.0	25,050	54,988			80,038	10,981	2,231			13,212	
2022	6604	City of Fort Collins - (CO)	CO	PSCO	5,676	7			5,683						3.0	1.0			4.0	1.4	0.3			1.7	32				32	680	42			722	0
2022	6709	Easley Combined Utility System	SC	DUK	637				637	0				0	0.5				0.5	0.5				0.5	33				33	16				16	
2022	6782	Freeborn Mower Electric Cooperative	MN	MISO	1,840	106	0	0	1,946	0	0	0	0	0	0.9	11.5	0.0	0.0	12.4	0.7	10.0	0.0	0.0	10.7	213	12	0	0	225	107	6	0	0	113	30
2022	7004	Buckeye Power, Inc	OH	PJM	121,533	40			121,573	2,326	359			2,685	34.7	6.0			40.7	34.7	6.0			40.7	272	0	0	0	272	210	0	0	0	210	
2022	7090	GreyStone Power Corporation	GA	SOCO		50	44		94		1	1		1		30.0	69.7		99.7		12.5	13.9		26.4											
2022	7140	Georgia Power Co	GA	SOCO	67,059	1,651	829	1	69,540						233.7	199.5	377.3		810.5	200.6	144.9	76.3		421.8	271	137	6,245		6,653	1,711	3,510	2,694	10	7,925	
2022	7294	City of Glendale - (CA)	CA	LDWP	2,113	25			2,138	7	1			9	2.0	0.6			2.6	1.8	0.3			2.2	90	11			101	420	402			823	
2022	7349	Golden Spread Electric Cooperative, Inc	OK	SWPP		1			1		0			0		2.0			2.0		0.0			0.0		18			18		0			0	
2022	7490	Grand River Dam Authority	OK	SWPP			1		1								14.0		14.0			14.0		14.0			759		759						
2022	7570	Great River Energy	MN	MISO	282,382	5,570			287,952	28,393	7,309			35,702	165.0	204.0			369.0	165.0	204.0			369.0	877	0			877	5,632	478			6,110	1,170
2022	7601	Green Mountain Power Corp	VT	ISNE	18,390	612	7	0	19,009	0	0	0	0	0	28.5	11.2	11.0	0.0	50.7	0.0	0.0	0.0	0.0	0.0	604	0	0	0	604	0	0	0	0	0	0
2022	7634	City of Greenville - (TX)	TX	ERCO		1			1		2,043			2,043		6.0			6.0																
2022	7752	Guadalupe Valley Elec Coop Inc	TX	ERCO	2,589				2,589	72				72	3.6				3.6	3.5				3.5	156				156					0	
2022	7785	Gulf Coast Electric Coop, Inc	FL	SOCO	738				738	1				1	0.9				0.9	0.9				0.9	0				0	2				2	
2022	7977	City of Hamilton - (OH)	OH	PJM			17		17			8		8			7.9		7.9			7.9		7.9			0		0		0			0	
2022	8179	Harrison County Rural E M C	IN	MISO	2,627				2,627						1.0				1.0																
2022	8210	Hart Electric Member Corp	GA	SOCO	29,326	9,079			38,405	167	44			211	2.4	0.6			3.0	2.4	0.6			3.0											
2022	8287	Hawaii Electric Light Co Inc	HI	NA	12				12	0				0	0.1				0.1						1				1						
2022	8319	Heartland Power Coop	IA	MISO	819	93	1	0	913	0	0	0	0	0	1.2	8.8	0.1	0.0	10.1	0.5	3.9	0.0	0.0	4.4	0	0	0	0	0	55	2	1	0	58	0
2022	8333	Haywood Electric Member Corp	NC	DUK	414				414	1				1	1.0				1.0	1.0				1.0	36				36						
2022	8570	Highline Electric Assn	CO	WACM			395		395								28.2		28.2								451		451			17		17	
2022	8570	Highline Electric Assn	NE	WACM			205		205								39.3		39.3								179		179			7		7	
2022	8773	Holy Cross Electric Assn, Inc	CO	PSCO	2,340	210	0	0	2,550	44	58	0	0	102	33.4	42.4	0.0	0.0	75.7	10.1	6.1	0.0	0.0	16.2	25	44	0	0	69	4	5	0	0	9	0
2022	8786	Horry Electric Coop Inc	SC	SC	6,353				6,353	0				0	8.7				8.7	8.7				8.7	12				12	63				63	134
2022	8901	CenterPoint Energy	TX	ERCO	22,361	353	0	0	22,714	59	787	0	0	845	19.6	143.8	0.0	0.0	163.4	19.6	143.8	0.0	0.0	163.4	780	3,658	0	0	4,438	59	201	0	0	260	
2022	9191	Idaho Power Co	ID	IPCO	18,910	150	2,078		21,138	0	0	0		0	24.2	21.6	225.3		271.1	18.1	18.6	136.7		173.4	375	284	7,652		8,311	430	85	578		1,093	0
2022	9191	Idaho Power Co	OR	IPCO	217	9	64		290	0	0	0		0	0.3	5.7	7.7		13.7	0.2	3.7	4.6		8.5	4	147	244		395	20	5	29		54	0
2022	9267	Hoosier Energy R E C, Inc	IN	MISO	17,157				17,157	0				0	2.2				2.2	2.2				2.2	6				6						
2022	9273	Indianapolis Power & Light Co	IN	MISO	59,057	351			59,408	1,163				1,163	47.8	0.8			48.6	33.4	0.2			33.6	1,525	14			1,539	2,141	1			2,141	
2022	9286	Illinois Municipal Elec Agency	IL	MISO		3			3		3			3		1.3			1.3		0.3			0.3		45			45		0			0	
2022	9324	Indiana Michigan Power Co	IN	PJM	5,026	85	75	0	5,186	76	0	0	0	76	5.0	7.3	304.0	0.0	316.3	4.1	0.0	0.0	0.0	4.1	108	0	0	0	108	452	0	0	0	452	0
2022	9324	Indiana Michigan Power Co	MI	PJM	3,969	0	0	0	3,969	21	0	0	0	21	1.9	0.0	0.0	0.0	1.9	1.1	0.0	0.0	0.0	1.1	47	0	0	0	47	310	0	0	0	310	36
2022	9417	Interstate Power and Light Co	IA	MISO	42,287	83	57		42,427	569	117	378		1,064	37.4	54.5	176.4		268.2						1,452	3,772	12,201		17,425	1,252	73	50		1,375	

Utility Characteristics					Yearly Energy and Demand Savings																					Program Costs										DSM Program
					Number of Customers Enrolled					Energy Savings (MWh)					Potential Peak Demand Savings (MW)					Actual Peak Demand Savings (MW)					Customer Incentives (Thousand Dollars)					All Other Costs (Thousand Dollars)					Grid Connected
Data Year	Utility Number	Utility Name	State	BA Code	Residential	Commercial	Industrial	Transportation	Total	Residential	Commercial	Industrial	Transportation	Total	Residential	Commercial	Industrial	Transportation	Total	Residential	Commercial	Industrial	Transportation	Total	Residential	Commercial	Industrial	Transportation	Total	Residential	Commercial	Industrial	Transportation	Total	Water Heater
2022	9425	Iowa Lakes Electric Coop	IA	SWPP	5,385	.	.	.	5,385	0	.	.	.	0	2.9	.	.	.	2.9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
2022	9431	Irwin Electric Membership Corp	GA	SOCO	.	.	605	.	605	.	.	96	.	96	.	.	45.4	.	45.4	.	.	12.0	.	12.0	.	.	0	.	0	.	.	18	.	18	.	
2022	9576	Jackson County Rural E M C - (IN)	IN	MISO	583	.	.	.	583	6	.	.	.	6	6.0	.	.	.	6.0	5.7	.	.	.	5.7	.	.	.	.	.	69	.	.	.	69	.	
2022	9590	Jackson Electric Coop, Inc - (TX)	TX	ERCO	.	.	10	.	10	.	.	.	.	.	.	.	46.0	.	46.0	.	.	39.0	.	39.0	.	.	2,128	.	2,128	.	.	.	.	.	.	
2022	9601	Jackson Electric Member Corp - (GA)	GA	SOCO	22,562	2,507	.	.	25,069	.	.	.	.	.	11.0	1.0	.	.	12.0	11.0	1.0	.	.	12.0	390	43	.	.	433	2	0	.	.	2	133
2022	9617	JEA	FL	JEA	.	.	33	.	33	.	.	.	.	.	.	.	144.2	.	144.2	.	.	130.4	.	130.4	.	.	7,899	.	7,899	.	.	.	.	.	.	
2022	9750	Jo-Carroll Energy, Inc	IL	MISO	1,674	0	7	0	1,681	0	0	.	0	0	1.3	0.0	2.1	0.0	3.4	0.5	0.0	0.8	0.0	1.3	94	0	36	0	130	15	0	6	0	21	.	
2022	9778	Johnson County Rural E M C	IN	MISO	.	.	2	.	2	.	.	22	.	22	.	.	3.7	.	3.7	.	.	3.7	.	3.7	.	.	58	.	58	.	.	2	.	2	.	
2022	10000	Evergy Metro	KS	SWPP	18,288	373	.	.	18,661	.	.	.	.	.	15.5	0.3	.	.	15.9	15.5	0.3	.	.	15.9	.	.	.	.	.	118	2	.	.	121	.	
2022	10000	Evergy Metro	MO	SWPP	37,615	785	.	.	38,400	755	86	.	.	841	32.0	23.3	.	.	55.3	32.0	23.3	.	.	55.3	347	587	.	.	934	1,904	631	.	.	2,535	.	
2022	10005	Evergy Kansas South, Inc	KS	SWPP	22,086	700	37	.	22,823	.	.	.	.	.	9.4	2.3	106.7	.	118.3	9.4	0.3	.	.	9.7	.	.	3,923	.	3,923	180	6	.	.	186	.	
2022	10171	Kentucky Utilities Co	KY	LGEE	67,599	894	.	.	68,493	.	.	.	.	.	71.7	11.4	.	.	83.1	.	.	.	.	.	.	.	.	.	.	1	0	.	.	1	.	
2022	10539	La Plata Electric Assn. Inc	CO	WACM	282	1	.	.	283	.	.	.	.	.	2.5	0.1	.	.	2.6	1.5	0.1	.	.	1.6	0	0	.	.	0	10	1	.	.	11	.	
2022	10596	City of Lake Crystal - (MN)	MN	MISO	270	.	.	.	270	3	.	.	.	3	.	.	.	.	.	.	.	.	.	.	5	.	.	.	5	.	.	.	.	.	0
2022	10768	Laurens Electric Coop, Inc	SC	DUK	5,660	0	2	0	5,662	13	0	4	0	17	7.1	0.0	3.0	0.0	10.1	7.1	0.0	1.8	0.0	8.9	.	.	.	.	.	.	.	.	.	.	.	
2022	10857	Lee County Electric Coop, Inc	FL	FPL	14,447	43	.	.	14,490	126	671	.	.	796	2.9	25.9	.	.	28.8	2.9	15.9	.	.	18.8	455	1,259	.	.	1,713	50	162	.	.	213	.	
2022	11018	Lincoln Electric System	NE	SWPP	2,940	.	.	.	2,940	.	.	.	.	.	4.2	.	.	.	4.2	4.2	.	.	.	4.2	93	.	.	.	93	152	.	.	.	152	.	
2022	11171	Long Island Power Authority	NY	NYIS	30,960	435	.	.	31,395	.	.	.	.	.	42.4	21.7	.	.	64.1	31.9	14.7	.	.	46.7	998	541	.	.	1,539	1,444	284	.	.	1,728	.	
2022	11187	City of Longmont	CO	PSCO	95	.	.	.	95	.	.	.	.	.	4.7	.	.	.	4.7	3.6	.	.	.	3.6	7	.	.	.	7	25	.	.	.	25	.	
2022	11208	Los Angeles Department of Water & Power	CA	LDWP	.	6	2	.	8	.	0	0	.	0	.	18.0	27.0	.	45.1	.	0.0	0.0	.	0.0	.	78	120	.	198	.	.	.	.	.	.	
2022	11241	Entergy Louisiana LLC	LA	MISO	.	.	9	.	9	.	.	32	.	32	.	.	256.4	.	256.4	.	.	.	.	.	.	.	32,034	.	32,034	.	.	.	.	.	.	
2022	11249	Louisville Gas & Electric Co	KY	LGEE	79,573	867	0	0	80,440	0	0	0	0	0	84.5	13.7	0.0	0.0	98.2	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	1,091	295	0	0	1,386	0
2022	11251	Loup River Public Power Dist	NE	SWPP	.	.	517	.	517	.	.	.	.	.	.	.	23.5	.	23.5	.	.	12.9	.	12.9	.	.	.	.	.	.	.	96	.	96	.	
2022	11291	Lumbee River Elec Member Corp	NC	CPLE	782	.	.	.	782	407	.	.	.	407	1.6	.	.	.	1.6	1.6	.	.	.	1.6	17	.	.	.	17	0	.	.	.	0	110
2022	11475	City of Madison - (SD)	SD	MISO	2,047	0	0	0	2,047	108	0	0	0	108	18.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0	169	0	0	0	169	4	0	0	0	4	0
2022	11501	Magic Valley Electric Coop Inc	TX	ERCO	1,378	.	.	.	1,378	7	.	.	.	7	3.0	.	.	.	3.0	2.5	.	.	.	2.5	34	.	.	.	34	25	.	.	.	25	.	
2022	11560	City of Manassas - (VA)	VA	PJM	1,976	.	.	.	1,976	8	.	.	.	8	0.7	.	.	.	0.7	0.7	.	.	.	0.7	.	.	.	.	.	19	.	.	.	19	.	
2022	11731	City of Marshall - (MN)	MN	MISO	4,225	300	33	0	4,558	752	3,100	357	0	4,209	3.6	3.3	1.1	0.0	8.0	3.6	3.3	1.1	0.0	8.0	117	272	90	0	479	37	11	3	0	51	41
2022	11843	Maui Electric Co Ltd	HI	NA	323	27	.	.	350	65	64	.	.	130	0.6	3.8	.	.	4.4	.	.	.	.	.	13	116	.	.	129	73	25	.	.	98	.	
2022	12199	Montana-Dakota Utilities Co	MT	SWPP	.	1	12	.	13	.	.	.	.	.	.	0.4	19.6	.	19.9	.	.	.	.	.	.	13	703	.	716	.	6	301	.	307	.	
2022	12199	Montana-Dakota Utilities Co	ND	MISO	.	21	6	.	27	.	.	.	.	.	.	7.6	11.3	.	18.8	.	.	.	.	.	.	205	606	.	811	.	33	30	.	63	.	
2022	12208	City of McPherson - (KS)	KS	SWPP	.	15	2	.	17	.	.	.	.	.	.	1.0	.	.	1.0	.	1.0	.	.	1.0	.	12	.	.	12	.	1	.	.	1	.	
2022	12260	Mecklenburg Electric Cooperative	VA	PJM	.	.	5	.	5	.	.	243	.	243	.	.	5.0	.	5.0	.	.	2.0	.	2.0	.	.	2,400	.	2,400	.	.	.	.	.	.	
2022	12268	Medina Electric Coop, Inc	TX	ERCO	.	744	.	.	744	.	.	.	.	.	.	73.9	.	.	73.9	.	40.3	.	.	40.3	.	.	.	.	.	.	177	.	.	177	.	
2022	12301	Nodak Electric Coop Inc	ND	MISO	5,382	.	307	.	5,689	23,313	.	686	.	23,999	136.7	.	65.5	.	202.2	51.1	.	45.5	.	96.6	28	.	0	.	28	258	.	7	.	265	.	
2022	12341	MidAmerican Energy Co	IA	MISO	62,011	42	57	.	62,110	252	251	1,422	.	1,925	55.0	39.0	221.0	.	315.0	55.0	39.0	221.0	.	315.0	1,330	1,052	5,964	.	8,346	2,118	51	290	.	2,459	.	
2022	12341	MidAmerican Energy Co	IL	MISO	3,224	2	3	.	3,229	17	34	194	.	245	3.6	4.6	25.9	.	34.1	3.6	4.6	25.9	.	34.1	74	107	604	.	785	94	3	18	.	115	.	
2022	12377	Midwest Energy Cooperative	MI	PJM	4,364	534	.	.	4,898	.	.	.	.	.	7.2	18.0	.	.	25.2	5.4	9.0	.	.	14.4	901	6	.	.	906	.	.	.	.	.	.	
2022	12395	Menard Electric Coop	IL	MISO	775	8	1,291	.	2,074	19	0	100	.	118	0.8	3.3	25.0	.	29.0	0.5	0.0	13.0	.	13.5	33	0	.	.	33	.	.	651	.	651	.	
2022	12539	Midwest Electric Member Corp	NE	WACM	0	0	1,602	0	1,602	0	0	0	0	0	0.0	0.0	34.1	0.0	34.1	0.0	0.0	15.9	0.0	15.9	0	0	2,971	0	2,971	0	0	273	0	273	0
2022	12647	ALLETE, Inc.	MN	MISO	7,156	492	6	0	7,654	798	289	4	0	1,090	26.0	2.7	239.6	0.0	268.3	.	.	.	.	.	2,132	535	5,725	0	8,392	.	.	.	.	.	.	
2022	12681	Mississippi County Electric Co	AR	MISO	.	.	853	.	853	.	.	.	.	.	.	.	3.0	.	3.0	.	.	2.0	.	2.0	.	.	330	.	330	.	.	217	.	217	.	
2022	12685	Entergy Mississippi LLC	MS	MISO	3,721	.	1	.	3,722	652	.	.	.	652	2.7	.	40.4	.	43.1	2.7	.	.	.	2.7	353	.	.	.	353	548	.	.	.	548	.	
2022	12686	Mississippi Power Co	MS	SOCO	95	6	6	0	107	42	0	0	0	42	0.0	24.2	80.0	0.0	104.2	0.0	0.0	0.0	0.0	0.0	238	474	100	0	812	0	0	0	0	0	.
2022	12698	Evergy Missouri West	MO	SWPP	30,440	768	.	.	31,208	730	129	.	.	859	25.9	59.0	.	.	84.9	25.9	59.0	.	.	84.9	407	1,365	.	.	1,772	2,121	1,454	.	.	3,575	.	
2022	12745	Modesto Irrigation District	CA	BANC	10,467	68	3	0	10,538	.	.	.	.	.	4.5	0.5	10.6	0.0	15.6	4.0	0.4	6.7	0.0	11.1	221	15	153	0	388	15	21	21	0	57	.	
2022	12894	City of Moorhead - (MN)	MN	SWPP	2,683	7	.	.	2,690	965	682	.	.	1,646	9.9	13.1	.	.	23.0	9.9	13.1	.	.	23.0	66	232	.	.	298	.	.	.	.	.	.	
2022	13208	City of Naperville - (IL)	IL	PJM	16	4	.	.	20	.	.	.	.	16	.	1.5	.	.	1.5	.	1.5	.	.	1.5	.	1	.	.	1	.	.	.	.	.	.	
2022	13337	Nebraska Public Power District	NE	SWPP	102	409	18	0	529	0	0	0	0	0	0.0	10.0	85.0	0.0	95.0	0.0	10.0	0.0	0.0	10.0	0	576	.	.	576	.	48	.	.	48	.	
2022	13407	Nevada Power Co	NV	NEVP	73,243	1,702	.	.	74,945	19,567	4,665	.	.	24,232	125.9	19.8	.	.	145.7	114.6	10.1	.	.	124.7	1,052	62	.	.	1,114	10,038	903	.	.	10,941	.	
2022	13441	New Hampshire Elec Coop Inc	NH	ISNE	4,859	.	.	.	4,859	3	.	.	.	3	2.6	.	.	.	2.6	2.6	.	.	.	2.6	293	.	.	.	293	112	.	.	.	112	.	
2022	13478	Entergy New Orleans, LLC	LA	MISO	5,886	145	1	.	6,032	.	17	.	.	17	4.4	1.3	21.8	.	27.5	4.4	1.3	.	.	5.7	261	103	.	.	363	253	1,082	.	.	1,335	.	
2022	13485	New Smyrna Beach City of	FL	FPL	2,755	.	.	.	2,755	0	.	.	.	0	5.0	.	.	.	5.0	0.0	.	.	.	0.0	150	.	.	.	150	.	.	.	.	.	.	
2022	13511	New York State Elec & Gas Corp	NY	NYIS	12,686	72	24	.	12,782	355	227	911	0	1,493	11.4	8.6	50.8	.	70.8	11.4	8.6	50.8	.	70.8	306	261	2,034	.	2,601	586	17	66	.	669	.	
2022	13519	City of Newark - (DE)	DE	PJM	1	1	1	0	2	0	0	0	0	1	0.0	0.5	0.2	0.0	0.7	0.0	0.5	0.2	0.0	0.7	0	14	5	0	19	0	0	0	0	0	.
2022	13573	Niagara Mohawk Power Corp.	NY	NYIS	19,782	163	64	.	20,009	506	3,021	1,712	.	5,239	18.9	131.8	74.7	.	225.3	11.6	103.2	58.5	.	173.3	299	1,714	972	.	2,985	565	314	178	.	1,056	.	
2022	13630	North Carolina Mun Power Agny #1	NC	DUK	17,548	68	19	.	17,635	56	3,037	3,403	.	6,496	1.0	72.0	74.0	.	147.0	1.0	52.0	61.0	.	114.0	.	.	.	.	.	.	.	.	.	.	.	
2022	13640	Northern Virginia Elec Coop	VA	PJM	35,173	2	5	0	35,180	0	119	23	0	142	7.7	10.8	10.1	0.0	28.6	7.7	10.0	7.1	0.0	24.8	0	0	535	0	535	152	0	0	0	152	0
2022	13664	Norris Public Power District	NE	SWPP	0	2	1,613	0	1,615	0	0	0	0	0	0.0	0.5	75.0	0.0	75.5	0.0	0.3	37.0	0.0	37.3	0	0	0	0	0	0	11	214	0	225	0
2022	13676	North Arkansas Elec Coop, Inc	AR	MISO	8,464	.	.	.	8,464	0	.	.	.	0	3.5	.	.	.	3.5	3.5	.	.	.	3.5	195	.	.	.	195	.	.	.	.	.	.	
2022	13683	North Carolina El Member Corp	NC	CPLE	12,109	.	1	.	12,110	.	.	.	.	.	29.2	.	1.0	.	30.2	.	.	.	.	.	495	.	.	.	495	2,951	.	.	.	2,951	832
2022	13687	North Carolina Eastern M P A	NC	CPLE	134,100	262	164	.	134,526	.	.	.	.	.	55.5	80.0	232.0	.	367.5	42.2	60.8	176.3	.	279.3	3,218	772	347	.	4,337	1,143	86	115	.	1,344	.	
2022	13725	City of North Platte	NE	SWPP	0	0	2	.	2	0	0	3	.	3	0.0	0.0	4.5	.	4.5	0.0	0.0	4.0	.	4.0	.	.	.	.	.	.	.	.	.	.	.	
2022	13762	Northern Neck Elec Coop, Inc	VA	PJM	4,523	.	.	.	4,523	101	.	.	.	101	2.8	.	.	.	2.8	2.8	.	.	.	2.8	7	.	.	.	7	.	.	.	.	.	.	
2022	13780	Northern States Power Co	WI	MISO	19,385	1,090	270	.	20,745	12	3	1,156	.	1,171	12.7	6.2	63.0	.	81.9	12.7	6.2	63.0	.	81.9	467	449	0	.	916	284	46	2	.	333	.	
2022	13781	Northern States Power Co - Minnesota	MN	MISO	398,375	17,700	1,654	.	417,729	499	120	1,511	.	2,130	336.0	84.4	255.0	.	675.4	336.0	84.4	255.0	.	675.4	29,599	5,046	213	.	34,858	7,542	1,621	627	.	9,790	.	
2022	13781	Northern States Power Co - Minnesota	ND	MISO	12,328	620	123	.	13,071	14	2	308	.	324	8.0	2.0	52.0	.	62.0	8.0	2.0	52.0	.	62.0	493	150	0	.	643	174	5	2	.	181	.	
2022	13781	Northern States Power Co - Minnesota	SD	MISO	21,464	602	102	.	22,168	22	3	89	.	114	14.9	2.9	15.0	.	32.8	14.9	2.9	15.0	.	32.8	1,621	203	0	.	1,824	182	17	3	.	200	.	
2022	13798	Northwest Iowa Power Coop	IA	SWPP	16,295	1,566	.	.	17,861	0	0	.	.	0	47.5	8.2	.	.	55.7	10.5	6.5	.	.	17.0	4,695	418	.	.	5,113	3,278	292	.	.	3,570	.	
2022	13815	Northwestern Wisconsin Elec Co	WI	MISO	.	.	1	.	1	.	.	.	.	.	.	.	1.0	.	1.0	.	.	1.0	.	1.0	.	.	30	.	30	.	.	.	.	.	.	
2022	13839	City of Norwood - (MA)	MA	ISNE	458	.	.	.	458	0	.	.	.	0	2.5	.	.	.	2.5	0.4	.	.	.	0.4	58	.	.	.	58	25	.	.	.	25	.	
2022	13936	Oakdale Electric Coop	WI	MISO	5,069	116	1	0	5,186	0	0	0	0	0	2.3	52.8	5.9	0.0	61.0	0.2	5.2	0.6	0.0	6.0	421	10	41	0	472	321	7	32	0	360	22
2022	13998	Ohio Edison Co	OH	PJM	0	0	16	0	16	0	0	0	0	0	0.0	0.0	216.4	0.0	216.4	0.0	.	216.4	0.0	216.4	0	0	8,797	0	8,797	0	0	0	0	0	.
2022	14063	Oklahoma Gas & Electric Co	AR	SWPP	0	14	0	0	14	0	0	0	0	0	0.0	60.1	0.0	0.0	60.1	0.0	0.0	0.0	0.0	0.0	0	3,137	0	0	3,137	0	0	0	0	0	0
2022	14063	Oklahoma Gas & Electric Co	OK	SWPP	111,016	16,671	0	0	127,687	4,669	9,639	0	0	14,308	77.7	176.4	0.0	0.0	254.1	77.7	8.4	0.0	0.0	86.1	0	6,312	0	0	6,312	1,262	189	0	0	1,451	0
2022	14127	Omaha Public Power District	NE	SWPP	56,043	21	1	0	56,065	6,970	0	0	0	6,970	82.7	31.5	12.0	0.0	126.2	81.2	31.5	12.0	0.0	124.7	1,417	1,178	601	0	3,196	331	40	0	0	372	0
2022	14154	Orange & Rockland Utils Inc	NY	NYIS	5,761	51	19	.	5,831	35	14	34	.	83	6.1	2.6	6.5	.	15.2	6.1	1.5	4.0	.	11.6	260	95	251	.	607	249	50	133	.	431	.	
2022	14175	Tri-County Electric Coop, Inc (SC)	SC	SC	17,326	.	242	.	17,568	1,013	.	320	.	1,333	3.0	.	0.0	.	3.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
2022	14232	Otter Tail Power Co	MN	MISO	18,350	1,598	0	0	19,948	0	0	0	0	0	17.0	35.0	0.0	0.0	52.0	17.0	35.0	0.0	0.0	52.0	23	11	0	0	34	42	40	0	0	82	.	
2022	14232	Otter Tail Power Co	ND	MISO	15,900	2,050	0	0	17,950	0	0	0	0	0	16.0	110.0	0.0	0.0	126.0	16.0	110.0	0.0	0.0	126.0	161	325	0	0	486	160	188	0	0	348	.
2022	14232	Otter Tail Power Co	SD	MISO	3,695	321	0	0	4,016	0	0	0	0	0	4.0	8.0	0.0	0.0	12.0	4.0	8.0	0.0	0.0	12.0	6	17	0	0	22	6	20	0	0	26	.
2022	14246	City of Owatonna - (MN)	MN	MISO	6,761	227	9	0	6,997	58	6	44	0	108	2.5	0.2	4.0	0.0	6.7	2.0	0.2	3.1	0.0	5.3	126	16	98	0	240	0	0	0	0	0	.
2022	14328	Pacific Gas & Electric Co.	CA	CISO	77,221	470	150	0	77,841	636	207	890	0	1,733	23.0	31.0	139.0	0.0	193.0	23.0	31.0	139.0	0.0	193.0	328	3,287	17,163	0	20,778	0	0	0	0	0	.
2022	14354	PacifiCorp	ID	PACE	.	.	154	.	154	.	.	.	.	.	.	.	169.0	.	169.0	.	.	125.4	.	125.4	.	.	.	.	.	.	.	3,602	.	3,602	0
2022	14354	PacifiCorp	OR	PACW	7	.	.	.	7	.	.	.	.	.	.	.	1.0	.	1.0	.	.	0.5	.	0.5	.	.	.	.	.	.	.	301	.	301	0
2022	14354	PacifiCorp	UT	PACE	93,904	.	30	.	93,934	.	.	.	.	.	301.0	.	12.0	.	313.0	266.0	.	11.3	.	277.3	3,273	.	2,937	.	6,210	3,539	.	378	.	3,917	0
2022	14398	Palmetto Electric Coop Inc	SC	SC	39,677	59	5	0	39,741	189	0	0	0	189	33.6	7.9	2.6	0.0	44.1	23.5	7.5	2.6	0.0	33.5	32	0	0	0	32	831	20	2	0	853	275
2022	14468	People's Cooperative Services	MN	MISO	3,591	78	4	0	3,673	0	0	0	0	0	2.5	4.5	0.6	0.0	7.6	1.4	2.4	0.3	0.0	4.1	424	9	32	0	465	144	3	11	0	158	0
2022	14557	Pee Dee Electric Coop, Inc	SC	SC	.	.	3	.	3	.	.	.	.	.	.	.	7.5	.	7.5	.	.	2.7	.	2.7	.	.	.	.	.	.	.	.	.	.	.	
2022	14717	Pee Dee Electric Member Corp	NC	CPLE	.	103	.	.	103	.	.	.	.	.	.	6.0	.	.	6.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
2022	15023	Piedmont Electric Member Corp	NC	DUK	6,885	129	.	.	7,014	.	.	.	.	.	5.4	0.2	.	.	5.6	5.4	0.2	.	.	5.6	125	2	.	.	127	150	3	.	.	152	.	
2022	15248	Portland General Electric Co	OR	PGE	165,915	853	0	0	166,768	.	.	.	.	.	77.5	76.2	.	.	153.7	.	.	.	.	.	2,675	1,563	0	0	4,238	2,333	3,872	0	0	6,205	.
2022	15270	Potomac Electric Power Co	DC	PJM	25,187	.	.	.	25,187	16	.	.	.	16	20.7	.	.	.	20.7	20.7	.	.	.	20.7	916	.	.	.	916	611	.	.	.	611	.	
2022	15270	Potomac Electric Power Co	MD	PJM	270,436	6,301	.	.	276,737	784	78	.	.	862	337.8	12.1	.	.	349.9	337.8	12.1	.	.	349.9	9,989	30	.	.	10,019	6,148	794	.	.	6,942	.	
2022	15344	Polk-Burnett Electric Coop	WI	MISO	7,035	93	0	0	7,128	0	0	0	0	0	36.2	0.8	0.0	0.0	37.0	5.0	0.1	0.0	0.0	5.1	0	0	0	0	0	23	0	0	0	23	70
2022	15466	Public Service Co of Colorado	CO	PSCO	216,177	522	139	.	216,838	3,679	4	1,746	.	5,429	268.0	1.0	245.9	.	514.9	268.0	1.0	245.9	.	514.9	8,911	13	26,474	.	35,399	6,622	224	1,069	.	7,914	.	
2022	15470	Duke Energy Indiana, LLC	IN	MISO	68,450	2,314	58	0	70,822	0	0	0	0	0	76.0	15.0	459.0	0.0	550.0	0.0	1.0	61.0	0.0	62.0	975	204	0	0	1,179	2,114	884	0	0	2,998	.
2022	15472	Public Service Co of NH	NH	ISNE	1,039	35	.	.	1,074	2	.	.	.	2	.	.	.	.	.	0.7	7.0	.	.	7.7	31	210	.	.	242	55	89	.	.	144	.	
2022	15473	Public Service Co of NM	NM	PNM	54,813	5,903	157	0	60,873	327	39	156	0	522	41.0	8.5	26.8	0.0	76.3	32.7	3.5	15.4	0.0	51.6	351	0	0	0	351	4,171	868	2,334	0	7,373	.
2022	15474	Public Service Co of Oklahoma	OK	SWPP	11,029	1,834	.	.	12,863	123	1,361	.	.	1,484	15.1	45.6	.	.	60.7	6.1	27.6	.	.	33.7	523	2,439	.	.	2,962	1,201	375	.	.	1,576	.	
2022	15671	Randolph Electric Member Corp	NC	CPLE	.	247	.	.	247	.	.	.	.	.	.	15.0	.	.	15.0	.	9.0	.	.	9.0	.	470	.	.	470	.	.	.	.	.	.	
2022	15700	Rayle Electric Membership Corp	GA	SOCO	.	.	2	.	2	.	.	0	.	0	.	.	3.0	.	3.0	.	.	1.3	.	1.3	.	.	.	.	.	.	.	.	.	.	.	
2022	15748	Town of Reading - (MA)	MA	ISNE	.	14	.	.	14	.	.	.	.	.	.	3.4	.	.	3.4	.	0.3	.	.	0.3	.	8	.	.	8	.	51	.	.	51	.	
2022	16060	Riverland Energy Cooperative	WI	MISO	6,106	173	.	.	6,279	.	.	.	.	.	3.1	7.2	.	.	10.3	3.1	7.2	.	.	10.2	1,148	28	.	.	1,176	53

Utility Characteristics					Yearly Energy and Demand Savings																					Program Costs									DSM Program
					Number of Customers Enrolled					Energy Savings (MWh)					Potential Peak Demand Savings (MW)					Actual Peak Demand Savings (MW)					Customer Incentives (Thousand Dollars)					All Other Costs (Thousand Dollars)					Grid Connected
Data Year	Utility Number	Utility Name	State	BA Code	Residential	Commercial	Industrial	Transportation	Total	Residential	Commercial	Industrial	Transportation	Total	Residential	Commercial	Industrial	Transportation	Total	Residential	Commercial	Industrial	Transportation	Total	Residential	Commercial	Industrial	Transportation	Total	Residential	Commercial	Industrial	Transportation	Total	Water Heater
2022	16627	San Patricio Electric Coop Inc	TX	ERCO			24		24			0		0			19.5		19.5			7.1		7.1			1,078		1,078						
2022	16674	Satilla Rural Elec Member Corporation	GA	SOCO		949	35		984		9	7		16		9.4	19.5		28.9		4.6	12.5		17.1							42	42		84	
2022	16740	Scenic Rivers Energy Coop	WI	MISO	5,233	490	8	0	5,731	0	0	0	0	0	6.9	0.4	1.0	0.0	8.3	2.5	0.1	0.4	0.0	3.0	267	25	35	0	327	170	16	23	0	209	0
2022	16805	SEMO Electric Cooperative	MO	AECI		358			358		545			545		2.8			2.8		0.8			0.8							26			26	
2022	16865	Sawnee Electric Membership Corporation	GA	SOCO	61,108	598	0	0	61,706	163	625	0	0	788	148.0	9.6	0.0	0.0	157.5	51.8	3.4	0.0	0.0	55.1	1,877	6			1,883	724	2			726	
2022	16971	Shakopee Public Utilities Comm	MN	MISO	1,193	0	0	0	1,193						2.0	0.0	0.0	0.0	2.0	0.7				0.7	22				22	30				30	
2022	17040	Shelby Electric Coop, Inc	IL	MISO	1,056	45			1,101						7.2	7.8			15.0	1.6	3.8			5.4						0	0			1	
2022	17066	Shenandoah Valley Elec Coop	VA	PJM	7,154				7,154	227				227	44.4				44.4	38.2				38.2						555				555	0
2022	17127	Town of Shrewsbury - (MA)	MA	ISNE	141				141	5				5	0.1				0.1						4				4	27				27	3
2022	17166	Sierra Pacific Power Co	NV	NEVP	11,482	385			11,867	2,451	532			2,983	18.6	4.1			22.7	14.2	2.9			17.1	90	13			103	1,593	483			2,076	0
2022	17267	Sioux Valley SW Elec Coop	MN	SWPP																															54
2022	17267	Sioux Valley SW Elec Coop	SD	SWPP																															385
2022	17470	PUD 1 of Snohomish County	WA	BPAT	575				575	0				0	0.2				0.2	0.2				0.2	21				21	78				78	
2022	17539	Dominion Energy South Carolina, Inc	SC	SCEG	0	12	24	0	36	0	214	810	0	1,024	0.0	34.0	133.0	0.0	167.0	0.0	12.0	30.0	0.0	42.0	0	332	5,811	0	6,143	0	0	0	0	0	0
2022	17543	South Carolina Public Service Authority	SC	SC	416		21	0	437	0		17,500	0	17,500	0.7		666.1	0.0	666.8	0.7		606.6	0.0	607.3	20		103,100	0	103,120	1,642		0	0	1,642	
2022	17572	South River Elec Member Corp	NC	CPLE	1,907				1,907	3				3	33.6				33.6																
2022	17599	Southeastern Indiana R E M C	IN	MISO	2,742				2,742	343				343	1.4				1.4	1.4				1.4	29				29	0				0	87
2022	17609	Southern California Edison Co	CA	CISO	222,081	7,075	1,734		230,890						179.0	95.0	471.0		745.0	167.0	64.0	321.0		552.0	26,146	19,389	59,666		105,201	6,552	407	587		7,546	
2022	17633	Southern Indiana Gas & Elec Co	IN	MISO	32,793	457	0	0	33,250	7,630	0	0	0	7,630	11.9	0.1	0.0	0.0	12.0	6.2	0.1	0.0	0.0	6.4	699	39	0	0	738	561	40	0	0	601	
2022	17637	Southern Maryland Elec Coop Inc	MD	PJM	39,382	94			39,476	0	0			0	39.0	13.6			52.6	39.0	13.6			52.6	1,695	151			1,846	2,568	835			3,403	
2022	17671	Southwest Arkansas E C C	AR	MISO	0	0	5	0	5	0	0	0	0	0	0.0	0.0	35.8	0.0	35.8	0.0	0.0	11.7	0.0	11.7	0	0	121	0	121	0	0	0	0	0	
2022	17684	Southwest Louisiana E M C	LA	MISO		5			5		29			29		0.3			0.3		0.3			0.3		4			4						
2022	17692	Southwest Public Power Dist	NE	SWPP			1,157		1,157			1,907		1,907			18.1		18.1			18.1		18.1								69		69	
2022	17698	Southwestern Electric Power Co	AR	SWPP																						136	14		150		23	2		25	
2022	17698	Southwestern Electric Power Co	TX	SWPP		6			6		65			65		5.0			5.0		3.8			3.8		113			113		19			19	
2022	17718	Southwestern Public Service Co	TX	SWPP	7,480	252			7,732	18	10			28	9.0	2.2			11.2	9.0	2.2			11.2	398	99			497	81	103			184	
2022	17832	Snapping Shoals El Member Corp	GA	SOCO	101,592	4,313	45		105,950																										
2022	18087	Town of Sterling - (MA)	MA	ISNE	169	3			172	1	0			1	0.2	0.6			0.8	0.1	0.1			0.2	7	0			7	0	0			0	
2022	18125	Stillwater Utilities Authority	OK	SWPP		1			1		21			21		2.0			2.0		0.0			0.0		1			1						
2022	18203	Tallapoosa River Elec Coop Inc	AL	SOCO			1		1			1		1			3.2		3.2			0.3		0.3			81		81			0		0	
2022	18280	Sulphur Springs Valley E C Inc	AZ	WALC	0	782	0	0	782	0	59	0	0	59	0.0	88.9	0.0	0.0	88.9	0.0	22.4	0.0	0.0	22.4	0	0	0	0	0	0	1	0	0	1	
2022	18304	Sumter Electric Coop, Inc	FL	SEC			8		8			84		84			13.0		13.0			12.0		12.0								374		374	
2022	18445	City of Tallahassee - (FL)	FL	TAL	0	4	0	0	4	0	0	0	0	0	0.0	40.1	0.0	0.0	40.1	0.0	0.0	0.0	0.0	0.0	0	6,322	0	0	6,322	0	0	0	0	0	0
2022	18454	Tampa Electric Co	FL	TEC	1	223	29	0	253	0	9,424	34,338	0	43,762	0.0	98.6	113.0	0.0	211.6	0.0	0.0	0.0	0.0	0.0	0	6,968	23,359	0	30,327	3,009	521	32	0	3,562	0
2022	18488	City of Taunton	MA	ISNE	10				10	27				27	10.0				10.0	7.0				7.0	131				131	0				0	
2022	18642	Tennessee Valley Authority	AL	TVA	0	108	59	0	167	0	146	15,885	0	16,031	0.0	4.6	417.4	0.0	422.0	0.0	4.6	428.5	0.0	433.1	0	118	21,177	0	21,295	0	118	47	0	165	
2022	18642	Tennessee Valley Authority	GA	TVA	0	0	3	0	3	0	0	495	0	495	0.0	0.0	23.5	0.0	23.5		0.0	21.0	0.0	21.0	0	0	1,353	0	1,353	0	0	0	0	0	
2022	18642	Tennessee Valley Authority	KY	TVA	0	84	58	0	142	0	8	15,186	0	15,269	0.0	3.8	304.5	0.0	308.3	0.0	2.6	294.2	0.0	296.8	0	84	20,219	0	20,303	0	61	30	0	91	
2022	18642	Tennessee Valley Authority	MS	TVA	0	45	17	0	62	0	56	22,961	0	23,017	0.0	1.9	461.4	0.0	463.3	0.0	1.7	495.6	0.0	497.3	0	50	27,160	0	27,210	0	45	7	0	52	
2022	18642	Tennessee Valley Authority	NC	TVA	0	0	2	0	2	0	0	3,443	0	3,443	0.0	0.0	46.1	0.0	46.1	0.0	0.0	44.7	0.0	44.7	0	0	3,721	0	3,721	0	0	0	0	0	
2022	18642	Tennessee Valley Authority	TN	TVA	0	750	329	0	1,079	0	1,086	18,052	0	19,138	0.0	48.0	710.3	0.0	758.3	0.0	33.8	618.6	0.0	652.4	0	1,593	31,947	0	33,540	0	806	326	0	1,132	
2022	18642	Tennessee Valley Authority	VA	TVA	0	4	1	0	5	0	2	0	0	2	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0	1	0	0	1	0	1	0	0	1	
2022	18997	The Toledo Edison Co	OH	PJM	0	0	4	0	4	0	0	0	0	0	0.0	0.0	193.2	0.0	193.2	0.0	0.0	193.2	0.0	193.2	0	0	10,767	0	10,767	0	0	0	0	0	
2022	19126	TriEagle Energy, L.P.	TX	ERCO	2,680	16	0	0	2,696	20	0	0	0	20	13.5	0.1	0.0	0.0	13.6	2.4	0.0	0.0	0.0	2.4	0	0	0	0	0	0	0	0	0	0	
2022	19157	MiEnergy Cooperative	IA	MISO	2,872	190			3,062	0	0			0	1.6	4.4			6.0	1.6	4.3			5.8	219	14			234	205	14			219	60
2022	19157	MiEnergy Cooperative	MN	MISO	5,328	353			5,681	0	0			0	3.0	8.2			11.1	2.9	7.9			10.8	407	27			433	381	25			406	190
2022	19160	Tri-County Electric Coop, Inc (OK)	OK	SWPP			13		13			173		173			0.5		0.5			0.3		0.3			3		3			2		2	
2022	19189	Trico Electric Cooperative Inc	AZ	WALC		20	2		22							3.6	0.0		3.6		1.5	0.0		1.5											
2022	19396	Tri-County Electric Coop (MI)	MI	MISO	6,094				6,094	0				0	25.7				25.7	15.0				15.0	662				662	0				0	36
2022	19436	Union Electric Co - (MO)	MO	MISO	42,733	826	120		43,679	625				625	59.6	64.5	18.2		142.3						1,634	1,612	454		3,700	3,629	1,917	541		6,087	
2022	19446	Duke Energy Kentucky	KY	PJM	13,936	9	3		13,948						13.0	6.0	7.0		26.0						208	463			671	564	437			1,001	
2022	19490	United Electric Coop Service Inc - (TX)	TX	ERCO	46,007	8,158	45		54,210	632	270	270		1,172	4.2	1.5	1.6		7.3	4.2	1.5	1.6		7.3	87				87						
2022	19497	United Illuminating Co	CT	ISNE	6,215	25	4	0	6,244						4.9	2.2	0.4	0.0	7.5	4.7	0.9	0.2	0.0	5.7	344	138	24	0	506	483	169	30	0	681	
2022	19499	United Power, Inc	CO	WACM	1,380	15	6		1,401						2.3	36.1	35.3		73.7		11.5	11.0		22.5	35	0	0		35	80	0	0		80	
2022	19547	Hawaiian Electric Co Inc	HI	HECO	31,902	237			32,139	2,383	465			2,848	20.5	9.1			29.6						1,310	1,854			3,164	681	401			1,082	
2022	19728	UNS Electric, Inc	AZ	TEPC		29			29							4.6			4.6		4.6			4.6							1			1	
2022	19790	Verendrye Electric Coop Inc	ND	MISO	3,390	377	0	0	3,767						15.3	1.7	0.0	0.0	17.0	5.3	0.6	0.0	0.0	5.9	102	11	0	0	113	9	1	0	0	10	
2022	19798	City of Vernon	CA	CISO			1		1			0		0			16.0		16.0			0.0		0.0			2,893		2,893			0		0	
2022	19876	Virginia Electric & Power Co	NC	PJM	2,324	198	0	0	2,522	0	0	0	0	0	1.1	0.2	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	82	4	0	0	86	117	41	0	0	158	0
2022	19876	Virginia Electric & Power Co	VA	PJM	65,864	21	0	0	65,885	0	0	0	0	0	37.0	5.9	0.0	0.0	42.9	0.0	0.0	0.0	0.0	0.0	2,112	509	0	0	2,621	3,921	111	0	0	4,032	0
2022	19896	City of Volga - (SD)	SD	SWPP																															22
2022	19951	City of Wadsworth - (OH)	OH	PJM	550				550						0.5				0.5						22				22	54				54	
2022	19981	Wake Electric Membership Corp	NC	CPLE		5	1		6	0		0		1		2.9	7.4		10.3		2.9	7.4		10.3		0	0		0	0	0			0	
2022	20401	West River Electric Assn Inc	SD	SWPP	4,676				4,676						44.1				44.1	31.4				31.4	37				37	98				98	
2022	20404	AEP Texas North Company	TX	ERCO		21			21		2			2		2.3			2.3		2.1			2.1		74			74		11			11	
2022	20472	Wharton County Elec Coop, Inc	TX	ERCO	796	31	10	0	837	0	0	0	0	0	2.8	5.6	19.4	0.0	27.9	2.8	3.2	8.4	0.0	14.5	134	90			224	116	77			193	
2022	20477	City of Westerville - (OH)	OH	PJM	939				939	10				10	1.0				1.0	0.8				0.8	18				18	20				20	
2022	20521	Wheeling Power Co	WV	PJM	12	0	0	0	12	1	0	0	0	1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	9	0	0	0	9	28	0	0		28	
2022	20603	Northeastern Rural E M C	IN	PJM	1,210	0	0	0	1,210	0	0	0	0	0	1.8	0.0	0.0	0.0	1.8	1.4	0.0	0.0	0.0	1.4	83	1			83	88				88	0
2022	20639	Wild Rice Electric Coop, Inc	MN	MISO	5,460	46	1		5,507	3,865	257	71		4,194	111.2	8.5	1.2		120.9	32.8	2.5	0.4		35.6	4,424	309	153		4,885	222	17	2		242	
2022	20737	Willmar Municipal Utilities	MN	MISO	1,998	287			2,285	3	0			3	3.0	0.4			3.4	2.7	0.4			3.1	0				0	63	9			73	
2022	20841	Wiregrass Electric Coop, Inc	AL	SOCO	3,957				3,957	0				0	4.8				4.8	0.0				0.0	0				0						
2022	20847	Wisconsin Electric Power Co	WI	MISO		28	56		84							2.5	121.1		123.6																
2022	20856	Wisconsin Power & Light Co	WI	MISO	1,910	0	101		2,011	21		69		90	2.2		122.0		124.2						211		8,474		8,686	340		0		340	
2022	20963	Woodruff Electric Coop Corp	AR	MISO			3,700		3,700			3,950		3,950			72.0		72.0			60.7		60.7			4,700		4,700			52		52	
2022	21002	York Electric Coop Inc	SC	DUK	5,947				5,947						25.0				25.0	6.2				6.2	155				155	1,615				1,615	
2022	21013	City of Worthington - (MN)	MN	MISO	2,337				2,337						7.0				7.0	2.3				2.3	0				0	8				8	
2022	21244	Southside Electric Coop, Inc	VA	PJM	1,271				1,271	4				4	12.0				12.0	3.0				3.0						13,298				13,298	
2022	21554	Seminole Electric Cooperative Inc	FL	SEC	2,112				2,112	4				4	4.2				4.2	3.7				3.7	53				53	112				112	
2022	21632	EnergyUnited Elec Member Corp	NC	DUK	11,150	152	5		11,307	340	273	145		758	10.0	8.0	4.0		22.0	10.0	7.0	3.0		20.0											
2022	22053	Kentucky Power Co	KY	PJM	0	0	7	0	7	0	0	0	0	0	0.0	0.0	7.4	0.0	7.4	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	
2022	22500	Evergy Kansas Central, Inc	KS	SWPP	24,441	771	1		25,213						10.4	1.7	15.0		27.1	10.4	0.3			10.7						199	6			205	
2022	24211	Tucson Electric Power Co	AZ	TEPC		161			161		2,530			2,530		28.4			28.4		28.4			28.4		109			109		38			38	
2022	24590	Unitil Energy Systems	NH	ISNE	755	20			775						0.6	2.7			3.2	0.6	2.7			3.2	26	93			119	31	11			42	
2022	24949	Cass County Elec Coop Inc	ND	MISO	8,496	418	514		9,428	15,582	7,992	3,343		26,917	272.2	129.2	54.0		455.4	73.5	34.9	14.6		123.0	63				63	578	28	36		642	79
2022	40051	Texas-New Mexico Power Co	TX	ERCO		80			80		7			7		7.8			7.8		7.3			7.3		220			220		29			29	
2022	40165	Dixie Escalante R E A, Inc	UT	PACE		228			228		334			334		21.7			21.7		10.7			10.7		562			562		59			59	
2022	40211	Wabash Valley Power Assn, Inc	IL	MISO	4,535		2		4,537						8.9		0.1		9.0	3.7		0.1		3.8	557		5		562	5				5	
2022	40211	Wabash Valley Power Assn, Inc	IN	PJM	50		98		148						0.0		3.3		3.3						3		187		190	2				2	
2022	40211	Wabash Valley Power Assn, Inc	IN	MISO	17,185	9	776		17,970						12.4	3.1	45.9		61.4	0.6	3.1	16.0		19.7	840	151	2,500		3,491	13		1		14	
2022	40211	Wabash Valley Power Assn, Inc	MO	MISO	191				191						0.2				0.2	0.1				0.1	13				13	2				2	
2022	40212	Colquitt Electric Membership Corp	GA	SOCO		5	2,210		2,215		6	1,318		1,324		0.3	86.8		87.1		0.3	86.5		86.7							6	60		66	
2022	40228	Rappahannock Electric Coop	VA	PJM	8,277	28			8,305	230				230	24.2				24.2	24.2				24.2	163				163						
2022	44372	Oncor Electric Delivery Company LLC	TX	ERCO	41,127	522			41,649	132	344			476	44.1	114.7			158.8	44.1	114.7			158.8	1,322	3,789			5,111	122	336			458	
2022	54913	NSTAR Electric Company	MA	ISNE	29,604	433			30,037						22.4	57.3			79.7	22.4	57.3			79.7	1,471	4,242			5,713	2,337	882			3,220	
2022	55787	City of Moreno Valley - (CA)	CA	CISO	0	15	0	0	15	0	41	0	0	41	0.0	0.8	0.0	0.0	0.8	0.0	0.7	0.0	0.0	0.7	0	0	0	0	0	0	8	0	0	8	
2022	55937	Entergy Texas Inc.	TX	MISO		8	4		12		7	15		22		10.3	92.3		102.6		6.9			6.9		200			200		26			26	
2022	56692	Marin Clean Energy	CA	CISO	1,707	34	0	0	1,741	34	6	0	0	40	2.6	6.0	0.0	0.0	8.6	0.6	0.1	0.0	0.0	0.7	73	18	0	0	91	11	11	0	0	21	
2022	57346	Efficiency Maine Trust	ME	ISNE		23			23							11.0			11.0		7.5			7.5		262			262		32			32	
2022	58127	Cape Light Compact	MA	ISNE	3,193		15		3,208						2.3		1.0		3.3	1.5		1.0		2.5	178		58		235	216		152		369	
2022	60631	Upper Michigan Energy Resources Corp.	MI	MISO			4		4								163.6		163.6																

PNNL-31994

Demand Response in Residential Energy Code

Technical Brief

September 2021

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U.S. DEPARTMENT OF ENERGY

Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830

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UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC05-76RL01830

Printed in the United States of America

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PNNL-31994

Demand Response in Residential Energy Code

Technical Brief

September 2021

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Prepared for
the U.S. Department of Energy
under Contract DE-AC05-76RL01830

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Preamble

The U.S. Department of Energy (DOE) and Pacific Northwest National Laboratory (PNNL) are developing a series of technical briefs supporting national, state, and local initiatives to update and advance building energy codes. These technical briefs represent specific technologies, measures, or practices that can be incorporated as module-based “plug-ins” via the national model energy codes, such as the International Energy Conservation Code (IECC) or ASHRAE Standard 90.1, or can be adopted directly by state and local governments pursuing advanced energy savings and greenhouse gas emissions reductions. The collection of briefs is part of a larger effort to provide technical assistance supporting states and local governments and to help them realize their policy goals.

This technical brief provides requirements for demand-responsive thermostats and water heaters that could be incorporated into model residential energy codes. It provides background on the benefits of these devices, impacts on the cost of construction, and model code language that can be plugged into the IECC or adapted into other energy codes.

Additional assistance may be available from DOE and PNNL to support states and local governments who are interested in adding demand response and other “stretch” provisions to their building codes. Assistance includes technical guidance, customized analysis of expected impacts (e.g., based on state-specific building stock, climate considerations, or utility prices), and further tailored code language to overlay state building codes or other standards. DOE provides this assistance in response to the Energy Conservation and Production Act, which directs the Secretary of Energy to provide technical assistance “to support implementation of state residential and commercial building energy efficiency codes” (42 USC 6833). PNNL supports this mission by evaluating concepts for future code updates, conducting technical reviews and analysis of potential code changes, and assisting states and local jurisdictions who strive to adopt, comply with, and enforce energy codes. This helps assure successful implementation of building energy codes, as well as a range of advanced technologies and construction practices, and encourages building standards that are proven to be practical, affordable, and efficient.

DOE Building Energy Codes Program

DOE supports the advancement of building energy codes. Modern building codes and standards offer cost-effective solutions, contributing to lower utility bills for homes and businesses and helping mitigate the impacts of climate change. Learn more at energycodes.gov.

Executive Summary

As buildings account for over 70% of U.S. electricity use, effectively managing their loads can greatly facilitate the transition towards a clean, reliable grid. Grid-interactive efficient buildings (GEBs) combine efficiency and demand flexibility with smart technologies and communication to provide occupant comfort and productivity while serving the grid as a distributed energy resource (DER). In turn, GEBs can play a key role in ensuring access to an affordable, reliable, sustainable and modern U.S. electric power system. Their national adoption could provide $100-200 billion in U.S. electric power system cost savings over the next two decades. The associated reduction in CO_2 emissions is estimated at 6% per year by 2030.[1]

Building codes represent standard design practice in the construction industry and continually evolve to include advanced technologies and innovative practices. Historically, national model energy codes establish minimum efficiency requirements for new construction.[2] Expanding codes to support GEB capabilities is a pivotal step towards realizing demand flexibility in support of a clean grid by addressing capabilities to improve interoperability between smart building systems, the grid, and renewable energy resources. Realizing GEBs requires buildings with automated demand response (DR) capabilities that enable standardized control, subject to explicit consumer consent, of energy smart appliances on an electricity network. This is achieved through communication between appliances and a controlling entity that is in communication with the consumer participants.

Energy codes can support DR communication standardization and advance the deployment of flexible load technologies such as smart home energy management systems, energy storage, behind-the-meter generation, and electric vehicles (EVs). Incorporating automated DR capabilities in energy codes provides many benefits to consumers and society. Specifically, it matches intermittent renewable energy sources to building electric loads, decreases peak load on the electric grid, allows buildings to respond to utility price signals, supports electrical network reliability and market growth of products and processes aligned with clean economic growth.

The incorporation of DR into the model residential energy codes was considered for the 2021 International Energy Conservation Code (IECC) code development cycle. The approved DR measures were later removed in response to appeals.[3] This technical brief updates the proposed DR components such that they can be considered by states and local governments for direct incorporation into their codes, as well as for future IECC energy code development. The proposal refinements are intended to support consistency in approach and provide a degree of certainty for building owners, designers, contractors, manufacturers, and building and fire safety professionals. The scope of this technical brief includes two strategies for DR in

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[1] DOE (U.S. Department of Energy). 2021. *A National Roadmap for Grid-Interactive Efficient Buildings*. Washington DC. Accessed on June 9, 2021 at https://gebroadmap.lbl.gov/

[2] While advanced codes can be considered model codes, in this document, the term "model energy code" refers to the current published version of the International Energy Conservation Code-Residential and ASHRAE Standard 90.1, as those documents are referenced by the Energy Conservation and Production Act, as modified by the Energy Policy Act of 1992, as the minimum requirements for states adopting energy codes. https://www.govinfo.gov/content/pkg/USCODE-2011-title42/pdf/USCODE-2011-title42-chap81-subchapII.pdf.

[3] https://www.iccsafe.org/building-safety-journal/bsj-technical/code-development-a-process-of-evolution-and-improvement/

residential buildings: 1) smart thermostats with demand-responsive control and 2) electric water heating incorporating demand-responsive controls and communication.

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1.0 Demand Response in Residential Energy Codes

A rapid transition of the U.S. power system is underway that is reshaping the operation and performance of the electric grid. Persistent growth in renewable energy resources—driven by declining costs, improved performance, and decarbonization policies[1]—is starting to noticeably impact the electricity system.[2] As buildings account for over 70% of U.S. electricity use, effectively managing their loads can greatly facilitate this transition towards a clean, reliable grid. Grid-interactive efficient buildings (GEBs) combine efficiency and demand flexibility with smart technologies and communication to provide occupant comfort and productivity while serving the grid as a distributed energy resource (DER). In turn, GEBs can play a key role in ensuring access to an affordable, reliable, sustainable and modern U.S. electric power system. Their national adoption could provide $100-200 billion in U.S. electric power system cost savings over the next two decades. The associated reduction in CO_2 emissions is estimated at 6% per year by 2030. DOE's national GEB vision is to triple energy efficiency (EE) and demand flexibility[3] (DF) of the buildings sector by 2030 relative to 2020 levels.[4]

Building codes represent standard design practice in the construction industry and continually evolve to include advanced technologies and innovative practices. Historically, national model energy codes establish minimum efficiency requirements for new construction.[5] Expanding codes to support GEB capabilities is a pivotal step towards realizing DF in support of a clean grid by addressing capabilities to improve interoperability between smart building systems, the grid, and renewable energy resources. Realizing GEBs requires buildings with automated demand response (DR) capabilities that enable standardized control, subject to explicit consumer consent, of energy smart appliances on an electricity network. This is achieved through communication between appliances and a controlling entity that is in communication with the consumer participants. Energy codes can support DR communication standardization and advance the deployment of flexible load technologies such as smart home energy management systems, energy storage, behind-the-meter generation, and electric vehicles (EVs).

Incorporating GEB considerations in energy codes can benefit all consumers by providing the following impacts:

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[1] Thirty-seven states representing 80% of the U.S. population have enacted renewable portfolio standards or goals.

[2] GridWise Architecture Council. 2015. *GridWise Transactive Energy Framework Version 1.0*. PNNL-22946, Ver 1.0. Accessed on September 27, 2018 at https://www.gridwiseac.org/pdfs/te_framework_report_pnnl-22946.pdf.

[3] Capability provided by DERs to reduce, shed, shift, modulate or generate electricity; energy flexibility and load flexibility are often used interchangeably with demand flexibility.

[4] DOE (U.S. Department of Energy). 2021. *A National Roadmap for Grid-Interactive Efficient Buildings*. Washington DC. Accessed on June 9, 2021 at https://gebroadmap.lbl.gov/

[5] While advanced codes can be considered model codes, in this document, the term "model energy code" refers to the current published version of the International Energy Conservation Code-Residential and ASHRAE Standard 90.1, as those documents are referenced by the Energy Conservation and Production Act, as modified by the Energy Policy Act of 1992, as the minimum requirements for states adopting energy codes. https://www.govinfo.gov/content/pkg/USCODE-2011-title42/pdf/USCODE-2011-title42-chap81-subchapII.pdf.

- Match the short-term availability of intermittent renewable energy sources, such as wind and solar, with building electric loads
- Decrease the peak load on the electrical transmission and distribution networks to alleviate the need for network upgrades to handle new electric loads
- Allow buildings to respond to utility price signals and provide grid services that control network characteristics, such as line frequency, system inertia and network voltage, and help prevent network and generation outages
- Allow electricity suppliers to offset their short-term market imbalance by controlling flexible load on the network
- Provide a market signal to companies and investors to develop products and processes that align buildings with the transition towards clean economic growth.

The incorporation of DR into the model residential energy codes was considered for the 2021 International Energy Conservation Code (IECC) code development cycle. The approved DR measures were later removed in response to appeals.[1] DOE developed this technical brief to update the DR concept such that it can be considered by states and local governments for direct incorporation into their codes, as well as for future IECC energy code development. The DR requirements specified in this technical brief build upon the language considered for the 2021 IECC, as well as that contained in the New Buildings Institute's Building Decarbonization Code (NBI 2021). In addition to sample code language, this technical brief adds further information and analysis developed by Pacific Northwest National Laboratory (PNNL). These requirement refinements are intended to support consistency in approach and provide a degree of certainty for building owners, designers, contractors, manufacturers, and building and fire safety professionals.

The scope of this technical brief includes two strategies for DR in residential buildings:

- Smart thermostats with demand-responsive control
- Electric water heating incorporating demand-responsive controls and communication.

1.1 Smart Thermostats with DR Control

Thermostats have evolved over the many years since their first introduction for scheduling and control of heating, ventilation, and air conditioning (HVAC) equipment. The first programmable thermostat was released to the market in 1906 with additional features and functionality added over the ensuing decades (DOE 2016). The first digital programmable thermostats were introduced in the mid-1980s. In the 1990s and into the 2000s, thermostats continued to evolve with additional sophistication such as individual day scheduling, equipment control choices, and ancillary services such as humidification, dehumidification, and ventilation. Programmable thermostats were projected to reduce HVAC energy use by 30% (Pang et al. 2020). However, expected levels of energy savings from programmable thermostats were not achieved because of consumer frustration or apathy on the intricacies of programming the thermostat (DOE 2016). Savings projections were based on correct and optimal use of programming functionality.

In response to the usability issues of programmable thermostats, connected (smart) thermostats with improved interfaces and learning algorithms were brought into the market. Smart thermostats capitalized on advancement of data and communication technologies as well as

[1] https://www.iccsafe.org/building-safety-journal/bsj-technical/code-development-a-process-of-evolution-and-improvement/

simplifying the scheduling process (DOE 2016). Today's smart thermostat market is under 15 years old and has evolved quickly through rapid growth and innovation. The interaction of smart thermostats with a smart home can enhance security, comfort, and convenience. The next generation of smart thermostats will communicate with the grid for demand-responsive control.

Smart thermostats with DR control for heating and cooling systems are designed to communicate with the utility grid and adjust heating and cooling setpoints to preprogramed levels during times of high demand or high energy prices. Thermostats with DR control allow grid operators to reduce residential heating and cooling demand on the grid and keep expensive and high-pollution-generating systems offline.

California's Title 24 Residential Code stipulates that heating, cooling, and ventilation systems have thermostatic control with the ability to:[1]

1. Automatically adjust temperature setpoints by +/- 4° Fahrenheit from a central point
2. Return the system to its original setpoint after the event
3. Provide an adjustable rate of change
4. Provide three modes of operation: automated demand shed, manual, and disabled.

Residential smart thermostat requirements described in the sample code language do not include all the controls of a Title 24 compliant thermostat, but a Title 24 compliant thermostat meets the residential DR control requirements prescribed in this technical brief.

1.2 Water Heating with DR Control

Water heating accounts for 19% of the annual energy consumption in the U.S. residential building stock.[2] Electric storage water heaters provide an excellent opportunity for load shedding/shifting due to the energy storage capacity of the hot water. Heat pump water heaters (HPWHs) have the potential to reduce the annual energy consumption of residential water heating by 60% when compared to electric resistance water heating (Mayhorn et al. 2015). HPWHs can be loaded (increase in water temperature) or turned down or off to take advantage of lower utility pricing and lower hourly carbon emission rates during periods of low demand. A study conducted by PNNL developed typical load shapes of HPWHs in the Pacific Northwest (Hunt et al. 2021). The HPWH load shapes can help utilities and DR aggregators establish baseline behavior and improve load forecasting algorithms.

Water heaters require a minimum storage capacity of 20 gallons to provide sufficient energy storage for adequate load flexibility. Four potential strategies for water heating demand-responsive control with various levels of sophistication and regulation are described below. The grid-connected strategy allows full DF in response to a real-time price signal or demand on the grid.

- Manual Control – manual adjustment of appliance loads
- On/Off Control – controlled on a fixed price time-of-use schedule
- Load Up/Shed – load up water heater over setpoint temperature during demand trough and shed on peak demand

[1] https://energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/ja52requiredfunctionalresources.htm
[2] https://www.eia.gov/todayinenergy/detail.php?id=37433

- Grid Connected – water heater control based on future forecasting of demand from utility.

Water heaters with demand-responsive control must be supplied with a communication link that meets the Consumer Technology Association Standard 2045 (CTA-2045) for communication with the electric grid or DR signal providers.[1] The CTA-2045 communication protocol stipulates controls to allow an HPWH to overload the tank temperature and increase storage capacity. The communication interface is analogous in concept to a USB socket on computers and other electronic equipment, but this socket is specifically designed for appliances.[2] CTA-2045 is the industry standard for demand-responsive control in water heaters but allows other communication protocols approved by a building official or other authority having jurisdiction.

1.3 Benefits of Demand Response

DR provides substantial benefits to the consumer, utilities, and society (Xing et al. 2018). Consumers can reduce energy consumption during peak demand, take advantage of time-of-use or real-time pricing, and lower electric utility bills. Utilities can reduce capital costs, reduce fuel consumption and operating costs, and increase productivity and profit margins while operating power plants at optimized speeds. Societal benefits include enhanced grid resilience and stability, lower carbon emissions, and higher penetration of renewable energy resources. It is difficult to place a value on the utility and consumer benefits of DR, but it appears to be a win-win situation for all. A more complete list of benefits is shown below.

Consumer Benefits

- Take advantage of time-of-use or real-time pricing
- Less rolling blackouts
- Reduced energy consumption during peak demand
- Reduced wholesale energy prices and prices paid by consumers
- Lower utility bills

Utility Benefits

- Reduced capital cost
- Reduced carbon emissions
- Reduced fuel consumption and operating costs
- Increased productivity and profit margins
- Operate power plants at optimized speeds
- Grid resilience and stability
- Enhanced voltage stability
- Balanced fluctuations in renewable energy generation

[1] https://www.techstreet.com/standards/cta-2045-a?product_id=2002822
[2] https://www.bpa.gov/EE/Technology/demand-response/Pages/CTA2045-DataShare.aspx

Societal Benefits

- Enhanced grid resilience and stability
- Reduced carbon emissions
- Higher penetrations of renewable energy resources

2.0 Economic Analysis

The costs associated with installing residential DR control strategies highlighted in this technical brief are discussed below. The installed costs for smart thermostats and electric water heaters with DR control are modest and depend on the design of the home.

The cost of a standard programmable thermostat required in the 2021 IECC ranges from $20 to $100 based on costs at local home improvement stores. A smart thermostat can range from $120 to $400 based on brand, model, and level of sophistication. The cost to install a programmable or smart thermostat ranges from $112 to $255, with the national average cost of $175.[1] Thus, the incremental cost of upgrading from a standard programmable thermostat to a smart thermostat with DR controls is anywhere between $100 and $200.

Electric resistance water heaters supplied with CTA-2045 communication have been manufactured but are not widely available. HPWHs have taken over the energy efficiency segment of the water heater market, and brands at local home improvement stores include the CTA-2045 communication ports. The average cost for a 50-gallon electric resistance heater is $400, while the average cost for a 50-gallon HPWH is $1,300 at local home improvement stores (Salcido et al. 2021). The incremental cost of $900 plus additional condensate removal equipment of $75 results in a total cost differential of $975. Therefore, for buildings already including HPWHs in the original design, the incremental increase in cost is $0. If the building specified an electric resistance water heater, the most straightforward way to implement the CTA-2045 communication for DR control is to switch to an HPWH with an incremental cost of $975.

While DR control functionality will reduce costs to utilities as well as electric costs to consumers, it is difficult to estimate or calculate the actual cost savings. DR will present cost-saving opportunities for buildings as more homeowners take advantage of time-of-use or real-time pricing controls as they become more widely available. Adding DR controls in model energy codes can help homeowners have the capability of participating in DR programs with alternative utility pricing structures whether they exist now or in the future. When DR requirements are part of the model energy code, it will not require homeowners or buildings to participate in any DR programs but will guarantee that residential buildings are capable of participating in DR programs.

[1] https://www.homeadvisor.com/cost/heating-and-cooling/install-a-thermostat/

3.0 Sample Code Language

This section contains model code language for any state or local government to overlay the 2021 IECC or that can be adapted to other existing residential energy codes.

3.1 Definitions

The following definition shall be added to Section R202 of the 2021 IECC residential energy code.

DEMAND-RESPONSIVE CONTROL. An automatic control that can receive and automatically respond to DR requests from a utility, electrical system operator, or third-party DR program provider.

3.2 Demand-Responsive Thermostats

The following DR requirements shall be placed in Section R403.1.1 of the 2021 IECC residential energy code or analogous location of other existing code.

R403.1.1 Programable thermostat. The thermostat controlling the primary heating or cooling system of the dwelling unit shall be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature setpoints at different times of the day and different days of the week. This thermostat shall include the capability to set back or temporarily operate the system to maintain zone temperatures of not less than 55 °F (13 °C) to not greater than 85 °F (29 °C). The thermostat shall be programmed initially by the manufacturer with a heating temperature setpoint of not greater than 70 °F (21 °C) and a cooling temperature setpoint of not less than 78 °F (26 °C). The thermostat shall be provided with Demand-Responsive Control capable of increasing the cooling setpoint by no less than 4 °F (2.2 °C) and decreasing the heating setpoint by no less than 4 °F (2.2 °C) in response to a DR request.

1. All demand-responsive controls shall be either:

    a. A certified OpenADR 2.0a or OpenADR 2.0b Virtual End Node (VEN), as specified under Clause 11, Conformance, in the applicable OpenADR 2.0 Specification[1], or

    b. Certified by the manufacturer as being capable of responding to a DR signal from a certified OpenADR 2.0b Virtual End Node by automatically implementing the control functions requested by the Virtual End Node for the equipment it controls, or

[1] The Sample Code Language provided for OpenADR and the communication pathway requirements is based on language published in Title 24 2019 Energy Code and the 2020 Nonresidential Grid Integration CASE report accessed on September 22, 2021 at https://www.energy.ca.gov/2018publications/CEC-400-2018-020/CEC-400-2018-020-CMF.pdf and https://title24stakeholders.com/wp-content/uploads/2020/08/NR-Grid-Integration_Final-CASE-Report_Statewide-CASE-Team.pdf

c. Comply with IEC 62746-10-1, an international standard for the open automated DR system interface between the smart appliance, system, or energy management system and the controlling entity, such as a utility or service provider[1], or

d. Comply with the communication protocol required by a controlling entity, such as a utility or service provider, to participate in an automated DR program.

2. All demand-responsive controls shall be capable of communicating to the VEN using one or more of the following: Wi-Fi, ZigBee, BACnet, Ethernet, or hard-wiring any other bi-directional communication pathway.

3. When communications are disabled or unavailable, all demand-responsive controls shall continue to perform all other control functions provided by the control.

3.3 Demand-Responsive Water Heating

The following DR requirements shall be placed in Section R403.5.4 of the 2021 IECC residential energy code or analogous location of other existing code.

R403.5.4 Demand-responsive water heating. All electric storage water heaters with a storage tank capacity greater than 20 gallons (76 L) shall be provided with demand-responsive controls that comply with CTA-2045 or another demand-responsive control approved by the Authority Having Jurisdiction.

[1] IEC 62746-10-1(E) specifies a minimal data model and services for demand response (DR), pricing, and distributed energy resource (DER) communications. It specifies how to implement a two-way signaling system to facilitate information exchange between electricity service providers, aggregators, and end users. The DR signaling system is described in terms of servers (virtual top nodes or VTNs), which publish information to automated clients (virtual end nodes, or VENs), which in turn subscribe to the information. Note the OpenADR 2.0b Profile Specification is known as IEC 62746-10-1 ED1.

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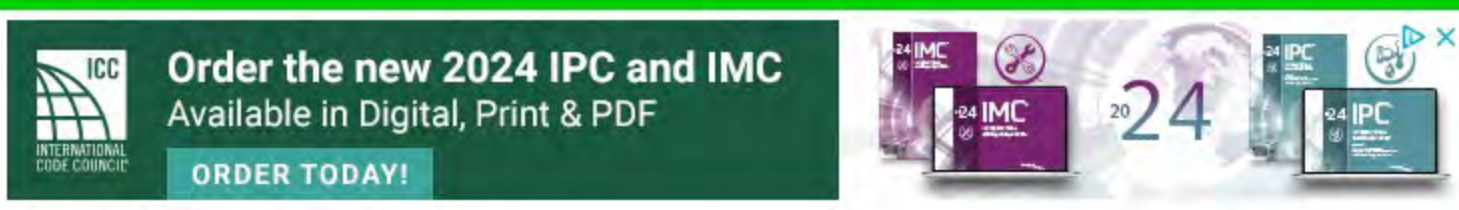

Cost to Design And Install Lighting Control System

June 2023

Lighting Control System Design And Installation Calculator

Zip Code 47474 | Systems 1 | Update

Item details	Qty	Low	High
Lighting Control System Design And Installation Labor, Basic Basic labor to design and install lighting control system with favorable site conditions. Collect owner requirements and room layout. Develop and present concepts. Refine design concept and fixture recommendations. Includes planning, equipment and material acquisition, area preparation and protection, setup and cleanup.	60.4 h	$6,927	$8,396
Totals - Cost To Design And Install Lighting Control System	1 EA	$6,927	$8,396
Average Cost per System		$6,926.85	$8,396.17

Service Pros Edit, Print & Save this in Homewyse Lists

Create your own price list in Homewyse Lists

In June 2023 the cost to Design And Install Lighting Control System starts at $6,927 - $8,396 per system. For accurate estimating, use our Cost Calculator for estimates customized to the location, size and options of **your project**.

To estimate costs for your project:

1. Set Project Zip Code Enter the Zip Code for the location where labor is hired and materials purchased.

2. Specify Project Size and Options Enter the number of "items" required for the project.

3. Re-calculate Click the "Update" button.

Cost to Design And Install Lighting Control System - Notes and General Information

These estimates are for BASIC work performed in serviceable conditions by qualified trade professionals using MID GRADE materials. Work not mentioned on this page and/or work using master craftsman, premium materials and project supervision will result in HIGHER COSTS!

These estimates are NOT substitutes for written quotes from trade professionals. Homewyse strongly recommends that you contact reputable professionals for accurate assessments of work required and costs for your project - before making any decisions or commitments.

The cost estimate **includes:**

- Costs for local material / equipment delivery to and service provider transportation to and from the job site.
- Costs to prepare the worksite for Lighting Control System Design And Installation, including costs to protect existing structure(s), finishes, materials and components.
- Labor setup time, mobilization time and minimum hourly charges that are commonly included for small Lighting Control System Design And Installation jobs.

The cost estimate does **NOT include:**

- Costs for removing, relocating, repairing, or modifying existing framing, surfacing, HVAC, electrical, and plumbing systems - or bringing those systems into compliance with current building codes.
- Costs for testing and remediation of hazardous materials (asbestos, lead, etc.).
- General contractor overhead and markup for organizing and supervising the Lighting Control System Design And Installation. Add 13% to 22% to the total cost above if a general contractor will supervise this project.
- Sales tax on materials and supplies.
- Permit or inspection fees (or portion thereof) required by your local building department for your overall project.

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Project Spending Data: Harvard University JCHS Homeowner Expenditures Harvard University, Jun 2023, Website

Labor Wages and Costs: Occupational Employment and Wage Statistics US Bureau of Labor Statistics, Jun 2023, Staff

Unit Costs: How Pros Price

Unlike other websites that publish pricing from unrelated jobs in the past, Homewyse creates up-to-date estimates from current **Unit Costs**. The **Unit Cost** method delivers high accuracy by using location, details and options for the unique requirements of each job. Contracting, trade, design and maintenance businesses rely on the **Unit Cost** method for transparency, accuracy and fair profits.

Lighting Control System Design And Installation Budget Management

This infographic highlights decisions and site issues that **can** cause large cost variances in the typical Lighting Control System Design And Installation budget.

Hiring Local Professionals

Our FREE hiring guide helps you hire wisely, get quality craftsmanship and understand fair pricing for your specific project.

Make Homewyse better

We're an involved community that values your input. So, let us know - did we meet your needs? how can we improve this site? Your comments and sharing are greatly appreciated!

- Send your feedback or questions.
- Save and share Homewyse on social media using the buttons below:

Bylaws for the International Code Council, Inc.
A Delaware Nonprofit Nonstock Corporation
Effective December 10, 2021

ARTICLE I — NAME AND OBJECTIVES

1.1 Name - This organization shall be known as the International Code Council, Inc., hereinafter in these Bylaws referred to as the "Council" or the "Corporation".

1.2 General Purposes - The Council is a nonprofit nonstock corporation and is not organized for the private gain of any person. The Corporation is organized exclusively as an organization described in Section 501(c)(6) of the Internal Revenue Code of 1986, as amended, or the corresponding provision in any future United States internal revenue law (the "Code"). Notwithstanding any other provision herein, the Corporation shall not engage in a regular business activity of a kind ordinarily carried on for profit and shall not carry on any other activity not permitted to be carried on by a corporation exempt from federal income tax under Section 501(c)(6) of the Code. It is organized under the Delaware General Corporation Law for public and charitable purposes. Such purposes specifically include:

With respect to buildings and structures: (a) the lessening of burdens of government through the development, maintenance and publication of model statutes and standards for the use by federal, state and local governments in connection with the administration of building laws and regulations, and (b) the lessening of the burdens of government through the performance of certain services for the benefit of federal, state and local governments in connection with the administration of building law and regulation.

1.3 Principal Office - The Corporation shall have and continuously maintain a registered office in the State of Delaware and a registered agent whose principal business office is identical with such registered office.

ARTICLE II — MEMBERSHIP

2.1 Categories of Membership - The Council shall have the following categories of voting membership:

2.1.1 Governmental Member - A Governmental Member shall be a governmental unit, department or agency engaged in the administration, formulation, implementation or enforcement of laws, ordinances, rules or regulations relating to the public health, safety and welfare. Each Governmental Member shall designate its Primary Representative who will receive benefits of membership in the Council on behalf of the Governmental Member as determined by the Board of Directors from time to time.

2.1.1.1 Governmental Member Voting Representatives - Each Governmental Member shall exercise its right to vote through its designated Governmental Member Voting Representatives, and shall be entitled to the number of Governmental Member Voting Representatives as specified in Table 2.1.1.1. Governmental Member Voting Representatives shall be designated in writing, by the Governmental Member, and shall be employees or officials of the Governmental Member or departments of the Governmental Member, provided that each of the designated voting representatives shall be an employee or a public official actively engaged either full or part time, in the administration, formulation, implementation or enforcement of laws, ordinances, rules or regulations relating to the public health, safety and welfare. The designation of a Governmental Member Voting Representative may be changed by the Governmental Member, in writing, from time to time.

Table 2.1.1.1	
Population	Voting Representatives
0 to 50,000	4
50,001 to 150,000	8
Over 150,000	12

2.1.2 Honorary Member - An individual who has rendered outstanding service to the Council, and whose name shall be proposed by the Board of Directors and confirmed by a majority vote of the Voting Members, as defined in Article III of these Bylaws, at an Annual Business Meeting.

2.1.3 Non-voting categories: The Board of Directors shall establish the non-voting categories of membership as may be necessary for the adequate representation of all parties interested in association with the International Code Council. Non-voting categories shall provide for membership of individuals and corporate entities and shall include, but not necessarily be limited to, employees of governmental units, design professionals, corporations, educational institutions, not-for-profit associations, and other individuals interested in the purposes and objectives of the Council.

2.2 Classification by the Board of Directors - All applications for membership shall be subject to classification by and approval of the Board of Directors. Applicants shall be eligible for membership on approval of the membership application by the Board and on timely payment of such dues and fees as the Board may fix from time to time. This authority may be delegated by the Board of Directors to the Chief Executive Officer.

2.3 Dues - The annual dues for each membership category shall be established by the Board of Directors. In no case shall a person be considered in good standing, or be qualified to exercise membership participation or entitled to receive any privilege of membership, who is default in payment of dues for three months, except as may be extended by the Board of Directors.

2.4 Termination - A membership in the Council shall terminate on occurrence of any of the following events:

(a) Resignation of the member;
(b) Expiration of the period of membership, unless the membership is renewed on the renewal terms fixed by the Board;
(c) The member's failure to pay dues, fees or assessments, as set forth by the Board, after they are due and payable;
(d) Any event that renders the member ineligible for membership, or failure to satisfy membership qualifications.

2.5 Nonliability of Members - A member of the Corporation shall not be personally liable, solely because of membership, for the debts, obligations, or liabilities of the Corporation.

ARTICLE III – VOTING MEMBERS

Only Governmental Member Voting Representatives and Honorary Members (collectively, the "Voting Members") shall have the right to vote on any matters under these Bylaws, including but not limited to, the right exercised through those individuals eligible to vote for the election of a Director or Directors, or on a disposition of all or substantially all of the assets, or on a dissolution, or on any changes to the Articles of Incorporation or the Bylaws. Only the Voting Members shall be permitted to make motions and to vote on any issue at the Annual Business Meeting, special meetings and written consents. Voting by proxy is not permitted. Any person designated as a Governmental Member Voting Representative of more than one Governmental Member or who is also an Honorary Member shall be entitled to only one vote.

ARTICLE IV —GEOGRAPHICAL REPRESENTATION

4.1 Limitations - To encourage wide geographical representation, no more than two Governmental Member Voting Representatives designated by Governmental Members located in the same state may serve simultaneously on any one committee nor may more than two Governmental Member Voting Representatives designated by Governmental Members located in the same state serve simultaneously on the Board of Directors.

4.2 Distribution - To provide for geographical representation on the Board of Directors, the following sections are established:

Table 4.2	
Section A	Alaska, British Columbia, Washington, Oregon, California, Nevada Hawaii
Section B	Idaho, Montana, Wyoming, North Dakota, South Dakota, Minnesota, Iowa, Wisconsin, Alberta, Saskatchewan, Manitoba
Section C	Utah, Arizona, Colorado, New Mexico, Oklahoma, Texas, Arkansas, Mexico
Section D	Nebraska, Kansas, Missouri, Illinois, Michigan, Indiana, Ohio, Kentucky, Ontario
Section E	Maine, Vermont, New Hampshire, New York, Massachusetts, Connecticut, Rhode Island, Pennsylvania, New Jersey, Delaware, Maryland, West Virginia, Virginia, Washington, D.C., Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland
Section F	Tennessee, Louisiana, Mississippi, Alabama, North Carolina, South Carolina, Georgia, Florida, the Caribbean

ARTICLE V — BOARD OF DIRECTORS

5.1 Governing Body - Subject to the limitations of the Certificate of Incorporation, these Bylaws and the laws of the State of Delaware, all corporate powers shall be exercised by the Board of Directors. The Board of Directors shall be composed of the following: President, Vice President, Secretary/Treasurer, the most Immediate Past President eligible; eight (8) Directors-at-Large, and six (6) Directors, one elected from each Section ("Sectional Directors"). Each member of the Board of Directors shall be a Governmental Member Voting Representative with the exception of the Immediate Past President. All members of the Board of Directors, except as provided in the Bylaws, shall be elected for a term of three years, and shall not serve for more than two consecutive full terms. However, nothing in this section shall preclude a Director initially appointed to a one or two year term, or appointed or elected to fill an unexpired term, from being elected to two subsequent full term(s). Each Sectional Director shall be and remain, throughout their term, a Governmental Member Voting Representative for a Governmental Member within the applicable Section.

5.2 Resignation, Disqualification and Vacancies - If the office of any director becomes vacant by reason of death, resignation, disqualification, removal or other cause, the President (or in the case the office of President is vacant, the Vice President) shall nominate a successor for the unexpired term and until their successor is elected and qualified at the next Annual Business Meeting, subject to the ratification of the Board of Directors. Any director, who ceases to be designated Governmental Member Voting Representative, for a period exceeding 60 days, shall automatically forfeit their position as a director.

5.2.1 Military Leave - Board members called to and serving active military duty shall not thereby become disqualified as a member of the board.

5.3 Removal of a Director - Any director may be removed from office upon the affirmative vote of two-thirds of the Voting Members present and voting at a duly held meeting of the members at which a quorum is present.

5.4 Election - Except as provided herein, the Board of Directors shall establish policies governing the conduct of elections and copies thereof shall be provided to any member requesting a copy. At each Annual Business Meeting a majority of the Voting Members present and voting shall elect such number of directors as necessary to fill vacancies of directors whose terms expire as of such meeting.

5.5 Quorum - At all meetings of the Board of Directors, two-thirds of the voting directors then in office shall constitute a quorum for transaction of business, and the act of a majority of the voting directors present at the meeting at which there is a quorum shall be the act of the Board of Directors, except as may be otherwise specifically provided by the law of the State of Delaware or by the certificate of incorporation. If a quorum shall not be present at any meeting of the Board of Directors, the directors present there at may adjourn the meeting from time to time, without notice other than announcement at the meeting until a quorum shall be present.

5.5.1 Written Action - Unless otherwise restricted by the certificate of incorporation or these Bylaws, any action required or permitted to be taken at any meeting of the Board of Directors may be taken without a meeting, if all voting members of the Board of Directors consent thereto in writing, and the writing or writings are filed with the minutes or proceedings of the Board of Directors.

5.5.2 Participation in Meetings by Conference Telephone - Members of the Board of Directors may participate in a meeting through use of conference telephone, electronic video screen communication, or other communication equipment if all of the following apply: (1) each director participating in the meeting can communicate with all of the other directors concurrently, (2) each director is provided the means of participating in all matters before the Board of Directors, including the capacity to propose, or to interpose an objection, to a specific action to be taken by the corporation and (3) the corporation adopts and implements some means of verifying both that (i) a person participating in the meeting is a director or other persons entitled to participate in the Board of Directors meeting and (ii) all actions of, or votes by, the Board of Directors are taken or cast only by the directors and not by persons who are not directors.

5.6 Meetings of the Board of Directors –

5.6.1 General - The Annual Meeting of the Board of Directors shall be held in conjunction with the time and place of the Annual Business Meeting. The Board of Directors shall meet at such other times and in such places as it may determine, and otherwise upon the call of the President or of a majority of the Board of Directors. Motions and votes at such meetings shall be duly recorded.

5.6.2 Organizational Meeting - At the conclusion of the Annual Business Meeting, the Board of Directors shall hold an organizational meeting at which time it may transact any necessary business, including any appointments pertinent to the ongoing business.

5.6.3 Closed Meetings - A meeting or portion of a meeting of the Board of Directors may be closed to persons not serving on the Board of Directors by a vote of the Board of Directors when matters that are sensitive to the purpose of the Council, including but not limited to budget, personnel, legal actions, and proprietary practices or materials are to be discussed. The Board of Directors may invite persons who are not members of the Board of Directors to attend portions, or all, of such closed meetings in an advisory capacity.

5.7 Authority - The Board of Directors may adopt any policy or procedure, or authorize any administrative action in the best interest of the Council and its membership.

5.8 Emergency Actions - In the event that the Board of Directors determines an emergency amendment to any International Code® or standard or supplements thereto is warranted, the same may be adopted by the Board of Directors. Such action shall require an affirmative vote of at least two-thirds

of the Board of Directors. The membership shall be notified, within ten days after the Board of Directors' official action, of any emergency amendment. At the next Annual Business Meeting any emergency amendment shall be presented to the members for ratification by a majority of the Voting Members present and voting.

ARTICLE VI — OFFICERS

6.1 Officers and Election - The Officers of the Council shall consist of a President, Vice President, Secretary/Treasurer (who shall be the chief financial officer of the Corporation), and Immediate Past President. Election of Officers for the ensuing year shall be held at the Annual Business Meeting, and Officers shall be elected from the Board of Directors by the Voting Members present and voting at the Annual Business Meeting, with the exception of the Immediate Past President. At no time shall more than one Officer located in any one state serve at the same time. Such Officers shall take office beginning at the conclusion of the Annual Business Meeting and shall serve until adjournment of the following Annual Business Meeting or until their successors are duly elected and qualified. Officers' tenure shall be limited to one single, full-year term in each office. Officers shall not act in their official capacity by proxy.

6.2 Duties of President - The President shall preside at the Annual Business Meeting, special meetings of the members and at meetings of the Board of Directors. The President shall be a regular member and preside at meetings of the Executive Committee and shall be an ex officio nonvoting member of all other committees. The President shall have other such duties as are prescribed by the Board of Directors or these Bylaws.

6.3 Duties of the Vice President - The Vice President shall act and perform the duties of the President during the President's absence from any meetings of this Corporation or the Board of Directors, or by a vote of the Board of Directors in case of disability of the President, and shall assist the President in the conduct of the office of President.

6.4 Duties of the Secretary/Treasurer - The Secretary/Treasurer shall be responsible for keeping the minutes and records of meetings, maintaining correspondence, receiving and disbursing funds, supervising financial affairs, approving expenditures as provided by resolution of the Board of Directors, and generally performing such official duties of a Secretary/Treasurer of a corporation. The Board of Directors may designate the Chief Executive Officer as the official agent for all or portions of such duties.

6.5 Resignation, Disqualification and Vacancies - If the position of any officer becomes vacant by reason of death, resignation, disqualification, removal or other cause, the President (or in the case the office of President is vacant, the Vice President) shall nominate a successor for the unexpired term and until their successor is elected and qualified at the next Annual Business Meeting, subject to the ratification of the Board of Directors. Any officer who ceases to be a member of the Board of Directors shall automatically forfeit their position as an officer.

ARTICLE VII — EXECUTIVE COMMITTEE

7.1 Executive Committee Members - There shall be an Executive Committee of the Board of Directors. The members of the Executive Committee shall be composed of the President, the Vice President, the Secretary/Treasurer and the Immediate Past President.

7.2 Powers and Duties - The Executive Committee shall have authority to act in such matters as are specifically delegated by the Board of Directors and take action on such matters delegated, as deemed prudent in furtherance of the general objectives of the Council. If an urgent situation arises and the President determines a matter requires immediate action or a timely decision, and it is not practical to convene a quorum of the Board of Directors, the Executive Committee shall have the authority to act on behalf of the Board unless otherwise specifically provided. The Executive Committee and the Chief Executive Officer

shall meet as necessary, between meetings of the Board of Directors, at a date and place designated by the President. Actions of the Executive Committee shall be reported to the Board of Directors without delay.

ARTICLE VIII — ADMINISTRATION

8.1 Chief Executive Officer - The Board of Directors shall appoint a Chief Executive Officer and such other officers as it shall designate, who shall serve at the pleasure of the Board. The Board of Directors shall fix the Chief Executive Officer's compensation. The Chief Executive Officer shall manage the affairs of the Council within the policies established by the Board of Directors and shall perform such other duties as may be assigned by the Board of Directors to the Chief Executive Officer. Neither the Chief Executive Officer nor any other officer appointed by the Board shall have a vote in the proceedings of this Council or of the Board of Directors.

ARTICLE IX — MEETINGS OF THE MEMBERS

9.1 Annual Business Meeting - A regular meeting of the Voting Members, herein referred to as the Annual Business Meeting shall be held each calendar year at a time and place designated by the Board of Directors.

9.1.1 Order of Business Meeting - The items of business at the Annual Business Meeting shall include, but not be limited to, the election of directors and officers, consideration of proposed amendments to these bylaws, and any other proper items of business as determined by the Board of Directors.
The order of business as announced at the meeting may be changed by a majority vote of the Voting Members present and voting at the Annual Business Meeting.

9.2 Special Meetings - Special Meetings of the Voting Members may be called at any time by the President with approval of two-thirds of the Board of Directors. The President shall call a special meeting upon the receipt of a valid petition, specifying purpose of the special meeting and bearing the names, titles, addresses, and signatures of five percent of the Voting Members.

9.3 Quorum - A quorum for the transaction of business at any annual or special meeting shall consist of 100 Voting Members.

9.4 Meeting Notice - A notice of the time and place of a special meeting shall be published not less than 60 days prior to the start of the special meeting. A notice of the time and place of the Annual Business Meeting shall be published not less than 60 days prior to the start of the Annual Business Meeting.

9.5 Eligibility to Vote - Voting Members in good standing under these Bylaws shall be entitled to vote at any meeting of Voting Members. Each Voting Member entitled to vote may cast one vote on each matter submitted to a vote of the Voting Members.

ARTICLE X — CODE DEVELOPMENT PROCESS

The Board of Directors shall adopt a policy, which may be amended from time to time, on the Code Development Process for the International Codes®.

ARTICLE XI — COMMITTEES

11.1 Committees, Councils - The Board of Directors may establish committees and councils as it shall deem advisable. The President shall, with the concurrence of the Board, appoint or replace all members of committees and councils not otherwise specifically provided for herein.

11.2 Board Authority - Any member of any committee or council may be removed by the Board at any time, subject to the limitations of the laws of the State of Delaware, and subject to any limitations of the Certificate of Incorporation or Bylaws regarding actions which require approval of the Voting Members. Each committee or council shall be under the direction of the Board and shall have such authority as shall be delegated and prescribed by the Board.

11.3 Nominating Committee - There shall be a Nominating Committee chaired by the Immediate Past President and consisting of Governmental Member Voting Representatives and/or Honorary Members having a reasonably distributed geographical representation. The Board of Directors shall establish policies governing the Nominating Committee and the conduct of elections. The Nominating Committee, excluding the Chairperson, shall have no more than one Governmental Member Voting Representative or Honorary Member from any one state.

11.4 Meetings of Committees - Except as otherwise provided by these Bylaws, committees and councils shall comply with the policies established by the Board of Directors.

ARTICLE XII — CHAPTERS

12.1 Organization - The Council shall encourage and recognize the establishment of regional, state, student, professional, local area and international chapter organizations of its members, the purpose of which shall be the furtherance of the objectives of the Council. Applications for the establishment of a chapter, together with a copy of the proposed chapter Bylaws and a list of those who have agreed to become members of the chapter, shall be submitted to the Board of Directors for approval. The chapter shall be established upon approval by the Board of Directors.

12.2 Management - All chapters shall be managed in accordance with policies established by the Board of Directors.

ARTICLE XIII — AUDITING AND REPORTS

13.1 Fiscal Year - The fiscal year of the Council shall be as determined by the Board of Directors.

13.2 Audit - There shall be an audit of the activities and financial affairs of the Council at the end of each fiscal year by an independent auditor selected by the Chief Executive Officer with the advice and consent of the Board of Directors. Such audit shall be submitted to the Board of Directors.

ARTICLE XIV — INDEMNIFICATION, INSURANCE AND DIRECTOR LIABILITY

14.1 Definitions - For the purposes of this Article XIV, "agent" means any person who is or was a director, officer, employee, or other agent of the Corporation, or is or was serving at the request of the Corporation as a director, officer, employee, or agent of another foreign or domestic corporation, partnership, joint venture, trust, foundation, or other enterprise, or was a director, officer, employee, or agent of a foreign or domestic corporation which was a predecessor corporation of the Corporation or of another enterprise at the request of such predecessor corporation; "proceeding" means any threatened, pending, or completed action or proceeding, whether civil, criminal, administrative, or investigative; and "expenses" includes without limitation attorneys' fees and any expenses of establishing a right to indemnification under Sections 14.4 or 14.5(b) of these Bylaws.

14.2 Indemnification in Actions by Third Parties - The Corporation shall have power to indemnify any person who was or is a party to, or is threatened to be made a party to, any proceeding (other than an action by or in the right of the Corporation to procure a judgment in its favor, an action for which indemnification is prohibited under Delaware Law, or an action brought by the Attorney General or a person granted relator status by the Attorney General for any breach of duty relating to the assets held in charitable

trust) by reason of the fact that such person is or was an agent of the Corporation, against expenses, judgments, fines, settlements and other amounts actually and reasonably incurred in connection with such proceeding if such person acted in good faith and in a manner such person reasonably believed to be in the best interests of the Corporation and, in the case of a criminal proceeding, had no reasonable cause to believe the conduct of such person was unlawful. The termination of any proceeding by judgment, order, settlement, conviction, or upon a plea of nolo contendere or its equivalent shall not, of itself, create a presumption that the person did not act in good faith and in a manner which the person reasonably believed to be in the best interests of the corporation or that the person had reasonable cause to believe that the person's conduct was unlawful.

14.3 Indemnification in Actions by or in the Right of the Corporation - The Corporation shall have power to indemnify any person who was or is a party to, or is threatened to be made a party to, any threatened, pending or completed action by or in the right of the Corporation, or brought by the Attorney General or a person granted relator status by the Attorney General for breach of duty relating to assets held in charitable trust, to procure a judgment in its favor by reason of the fact that such person is or was an agent of the Corporation, against expenses actually and reasonably incurred by such person in connection with the defense or settlement of such action if such person acted in good faith, in a manner such person believed to be in the best interest of the Corporation, and with such care, including reasonable inquiry, as an ordinarily prudent person in a like position would use under similar circumstances. No indemnification shall be made under this Section 14.3:

(a) In respect to any claim, issue or matter as to which such person shall have been adjudged to be liable to the Corporation in the performance of such person's duty to the Corporation, unless and only to the extent that the court in which such proceeding is or was pending shall determine upon application that, in view of all the circumstances of the case, such person is fairly and reasonably entitled to indemnity for the expenses which such court shall determine;

(b) Of amounts paid in settling or otherwise disposing of a threatened or pending action, with or without court approval; or

(c) Of expenses incurred in defending a threatened or pending action which is settled or otherwise disposed of without court approval unless it is settled with the approval of the Attorney General.

14.4 Indemnification Against Expenses - To the extent that an agent of the Corporation has been successful on the merits in defense of any proceeding referred to in Sections 14.2 or 14.3 of these Bylaws or in defense of any claim, issue, or matter therein, the agent shall be indemnified against expenses actually and reasonably incurred by the agent in connection therewith.

14.5 Required Determinations - Except as provided in Section 14.4 of these Bylaws, any indemnification under this Article XIV shall be made by the Corporation only if authorized in the specific case, upon a determination that indemnification of the agent is proper in the circumstances because the agent has met the applicable standard of conduct set forth in Sections 14.2 or 14.3 of these Bylaws, by:

(a) A majority vote of a quorum consisting of Directors who are not parties to such proceeding; or

(b) The court in which such proceeding is or was pending upon application made by the Corporation or the agent or the attorney or other person rendering services in connection with the defense, whether or not such application by the agent, attorney, or other person is opposed by the Corporation.

14.6 Advance of Expenses - Expenses incurred in defending any proceeding may be advanced by the Corporation prior to the final disposition of such proceeding upon receipt of an undertaking by or on behalf of the agent to repay such amount unless it shall be determined ultimately that the agent is entitled to be indemnified as authorized in this Article XIV.

14.7 Other Indemnification - No agreement made by the Corporation to indemnify its (or its subsidiaries') Directors or Officers shall be valid unless such agreement is consistent with this Article XIV.

In the event of any inconsistencies between this Article XIV and any other provisions regarding indemnification of Directors and Officers by the Corporation, this Article XIV shall prevail. Nothing contained in this Article XIV shall affect any right to indemnification held by persons other than Directors and Officers.

14.8 Forms of Indemnification Not Permitted - No indemnification or advance shall be made under this Article XIV, except as provided in Section 14.4 or 14.5(b), in any circumstances where it appears:

(a) That it would be inconsistent with a provision of the Certificate of Incorporation, these Bylaws, or an agreement in effect at the time of the accrual of the alleged cause of action asserted in the proceeding in which the expenses were incurred or other amounts were paid, which prohibits or otherwise limits indemnification; or

(b) That it would be inconsistent with any condition expressly imposed by a court in approving a settlement.

14.9 Nonpaid Directors - Except as otherwise required under Delaware Law, there shall be no monetary liability on the part of, and no cause of action for damages shall be asserted against, any nonpaid Director, including any nonpaid Director who is also a nonpaid Officer of the corporation, based upon any alleged failure to discharge the person's duties as Director or Officer if the duties are performed in a manner that meets all of the following criteria:

(a) The duties are performed in good faith;

(b) The duties are performed in a manner such Director believes to be in the best interests of the Corporation; and

(c) The duties are performed with such care, including reasonable inquiry, as an ordinarily prudent person in a like position would use under similar circumstances.

14.10 Insurance - The Corporation shall have power to purchase and maintain insurance on behalf of any agent of the Corporation against any liability asserted against or incurred by the agent in such capacity or arising out of the agent's status as such whether or not the Corporation would have the power to indemnify the agent against such liability under the provisions of this Article XIV; provided, however, that the Corporation shall have no power to purchase and maintain such insurance to indemnify any agent of the Corporation for a violation that may not be indemnified under Delaware law.

14.11 Nonapplicability to Fiduciaries of Employee Benefit Plans - This Article XIV does not apply to any proceeding against any Director, investment manager, or other fiduciary of an employee benefit plan in such person's capacity as such, even though such person may also be an agent of the Corporation as defined in Section 14.1 of these Bylaws. The Corporation shall have power to indemnify such Director, investment manager, or other fiduciary to the extent permitted under Delaware Law.

If any part of this Article XIV shall be found in any action, suit or proceeding to be invalid or ineffective, the validity and the effectiveness of the remaining parts shall not be affected.

ARTICLE XV — AUTHORITY AND BENEFIT

15.1 No Benefit to Any Individual - No part of the net earnings, if any, of this Council shall inure to the benefit of any member or other individual, and no gain, profit, or dividends shall ever be distributed to any member of this Council or inure to the benefit of any private persons, except as provided for in these Bylaws.

15.2 No Authority to Act - A member or chapter or any officer or member thereof shall not participate in or purport to have authority to act on behalf of or bind this Corporation to any legal obligations or liability, except as provided in these Bylaws, or resolution or policy of the Board of Directors.

ARTICLE XVI — DISSOLUTION

In the event of a dissolution or final liquidation of the Council, all of the remaining assets and property of the Council shall, after paying or making provision for the payment of all of the liabilities or obligations of the Council and for necessary expenses thereof, shall be transferred to one or more organizations which will (i) dedicate such assets and property to public and/or charitable purposes, and (ii) qualify as tax exempt organizations under Section 501(c)(3), Section 501(c)(4), or Section 501(c)(6) of the Code.

ARTICLE XVII — RULES OF ORDER

Roberts Rules of Order shall govern all aspects of a parliamentary nature unless otherwise provided for by the Board of Directors.

ARTICLE XVIII — AMENDMENTS TO BYLAWS

18.1 Proposals - Proposed amendments to these Bylaws, to be considered at an Annual Business Meeting, shall be signed by at least 100 Voting Members and shall be presented to the Board of Directors at least 90 days prior to the opening of an Annual Business Meeting or must be proposed through resolution of at least ten of the members of the Board of Directors at least 90 days prior to the opening of an Annual Business Meeting.

18.2 Notice of Actions - The Board of Directors shall cause proposed amendments to the Bylaws to be printed in the Annual Business Meeting notice. The Board of Directors shall present its recommendations for each proposal, including reasons for recommending such action(s), at the Annual Business Meeting. These proposed amendments may be discussed and amended at the Annual Business Meeting, and if passed by a two-thirds vote of those Voting Members present, shall be sent by ballot, as amended on the floor, to all Voting Members of the Council for ratification. To be considered, the ballots submitted by the Voting Members shall be received within 30 days of distribution. A two-thirds majority of the ballots submitted by Voting Members is required for adoption. The returns shall be certified by the President if the necessary majority for adoption is received.

18.3 Effective Date - The approved amendments become effective ten days thereafter unless otherwise provided in the amendment.

ARTICLE XIX — OPERATIVE DATE

19.1 General - These Bylaws shall be effective and operative upon the date on which the Merger of International Code Council, Inc. (California) and International Code Council, Inc. (Delaware) becomes effective.

19.2 Committees - Council committees in existence as of the operative date of these Bylaws to the extent permitted under these Bylaws shall not be deemed abolished by the adoption of these Bylaws, subject to the right of the Board of Directors to remove them.

19.3 Previous Action Remains in Effect - Upon the operative date of these Bylaws, all prior actions consistent with these Bylaws, whether pursuant to resolution or policy, of the Board of Directors, or any other committee, remain in effect until modified, repealed or otherwise superseded.

[History: The original ICC Bylaws were approved on July 24, 2002. Seven amendments were presented to the ICC membership at the ABM on September 27, 2004. The amendments were approved and ratified by letter ballot sent to all Governmental Members. The results of the election were certified by the ICC President on December 19, 2004, and became effective on December 29, 2004. One amendment was presented to the ICC membership at the ABM on September 27, 2005. The amendment was approved

and ratified by letter ballot sent to all Governmental Members. The results of the election were certified by the ICC President on January 3, 2006 and became effective on January 13, 2006. Two amendments were presented to the ICC membership at the ABM on September, 2006. The amendment was approved and ratified by letter ballot sent to all Governmental Members. The results of the election were certified by the ICC President on April 5, 2007, and became effective on April 15, 2007. One amendment was presented to the ICC membership at the ABM on October 2, 2007. The amendment was approved and ratified by letter ballot sent to all Governmental Members. The results of the election were certified by the ICC President on January 23, 2008, and became effective on February 2, 2008. One amendment was presented to the ICC membership at the ABM on September 16, 2008. The amendment was approved and ratified by letter ballot sent to all Governmental Members. The results of the election were certified by the ICC President on January 12, 2009, and became effective on January 14, 2009. Two amendments were presented to the ICC membership at the ABM on November 3, 2009. One amendment was approved and ratified by letter ballot sent to all Government Member Voting Representatives. The results of the election were certified by the ICC President on February 26, 2010. Four amendments were presented to the ICC membership at the ABM on November 1, 2011. One amendment was approved and ratified by letter ballot sent to all Government Member Voting Representatives. The results of the election were certified by the ICC President on February 7, 2012. One amendment was presented to the ICC membership at the ABM on October 23, 2012. The amendment was approved and ratified by letter ballot sent to all Governmental Member Voting Representatives. The results of the election were certified by the ICC President on February 5, 2013. An amendment was presented to the ICC membership on October 22, 2020 as part of a statutory merger ballot. The statutory merger ballot and relative amendment were approved on November 12, 2020 and became effective on January 1, 2021. Two amendments were presented to the ICC membership at the ABM on September 20, 2021. The amendments were approved and ratified by electronic ballot sent to all Voting Members. The results of the election were certified by the ICC President on December 1, 2021 and became effective on December 10, 2021.**]**

WE ARE APARTMENTS

The country needs to build 4.3 million more apartments by 2035.

NATIONAL DATA

Apartments and their residents contribute $3.4 trillion to the U.S. economy annually, supporting 17.5 million jobs.

The number of affordable units (those with rents less than $1,000 per month) declined by 4.7 million from 2015 to 2020.

Our Resources

The apartment industry stands ready to work with urban, suburban and rural communities in every region to meet the housing demand of Americans across all income levels.

Our Resources

Hoyt Advisory Services; NMHC / NAA; 2021 American Community Survey, U.S. Census Bureau

MAY 16, 2022

President Biden Announces New Actions to Ease the Burden of Housing Costs

FACT SHEET | BRIEFING ROOM | STATEMENTS AND RELEASES

New Biden-Harris Administration Housing Supply Action Plan to Help Close the Housing Supply Gap in the U.S.

As President Biden said last week, tackling inflation is his top economic priority. Lowering the cost of housing is a critical piece of that effort. It takes on the burden of housing costs by increasing the supply of quality housing in every community. His plan includes legislative and administrative actions to ease the burden of housing costs for families, including by cutting with the certain prescription drug bill of thousands of affordable housing units in the next four years. Prime digital with other administration actions, the plan will lower housing costs for renters and homeowners. Crucially, it brings the gap of 3.8 million affordable rental and owner-attainable homeownership the Americans to move into a home they can afford, in a community they want to live in, and to be thriving equally shielded in America.

The Plan will help renters who are struggling with high rental costs, with a focus on those who are at risk of homelessness or living in low-quality apartments. Increasing the Plan particular to lower supply and an important element of bringing homeownership within reach the Americans. Today, the median price of a home is nearly $400,000 and the median price of a home sold last year increased by nearly 20 percent. Increasing the supply of homes, or housing units made up about one third of all the market-leader for inflation, is essential to the Administration Press Release.

Under the Plan, the Administration will:

- **Increase production that will lower rental housing and lead our policies with higher income or remain housing** and grant provisions, the first time we have ever done so.
- **Double or shorten the time to construct a federal process** even housing where planning gap currently under consideration of housing building permits, and **cut the time to construct a federal process** in half, and **cut the time to construct a federal process** in half, and prefabricated buildings.
- **Expand and improve existing, lower-cost federal financing**, including for affordable multifamily development and preservation. This includes increasing the supply of low-income housing tax credits (LIHTC) and commitment that is also a long-term mortgage-secure credit, established by exploring the feasibility of lower-fee purchase of these loans, promoting the use of LIHTC and other federal housing finance programs, including expand affordable housing development and construction jobs in the Section Housing Tax Credit (LIHTC), which provides credits to private developers of affordable housing in exchange for a set-aside of units for low-income tenants, and the Department of Treasury's Community Development Financial Institutions Fund (CDFI Fund).
- **Ensure that more government-owned supply of homes and other housing** **space** is used for affordable housing — or, even better, for sale and rent-to-own — not large institutional investors.

Work with the private sector to address supply chain challenges and improve housing technology to **provide construction in 30 days or the most** **cost-efficient** for the year 2030.

Today's strong housing sector sets the stage for the building. Direct and lower-income housing supply, including the Biden-Harris Administration's Plan to Close the Gap — continuing housing supply, including the lower-cost rental housing and homeownership. This year's investment housing supply and homeownership

National Association of Home Builders

NATIONAL MULTIFAMILY HOUSING COUNCIL

Regulation: 40.6 Percent of the Cost of Multifamily Development

Paul Emrath, National Association of Home Builders (NAHB)
Caitlin Sugrue Walter, National Multifamily Housing Council (NMHC)

Regulation imposed by all levels of government accounts for an average of 40.6 percent of multifamily development costs, according to research by NAHB and NMHC.

Apartment development can be subject to a significant array of regulatory costs, including a broad range of fees, standards and other requirements imposed at different stages of the development and construction process. This joint research effort surveyed NAHB and NMHC members to quantify how much regulation exists and how much it is adding to the cost of developing much-needed new multifamily properties.

About NAHB

The National Association of Home Builders (NAHB) strives to protect the American Dream of housing opportunities for all, while working to achieve professional success for its members who build communities, create jobs and strengthen our economy. NAHB Multifamily provides services, benefits and opportunities to members with an interest in multifamily housing, including multifamily member meetings, newsletters, events, webinars and multifamily housing awards. It coordinates with other NAHB departments on advocacy efforts, economic studies and resources for multifamily housing. For more information, please visit NAHB Multifamily at nahb.org/nahb-community/councils/multifamily-council.

About NMHC

Based in Washington, D.C., the National Multifamily Housing Council (NMHC) is the leadership of the apartment industry. We bring together the prominent owners, managers and developers who help create thriving communities by providing apartment homes for 40 million Americans, contributing $3.4 trillion annually to the economy. NMHC provides a forum for insight, advocacy and action that enables both members and the communities they help build to thrive. For more information, contact NMHC at 202/974-2300, e-mail the Council at info@nmhc.org, or visit NMHC's website at nmhc.org.

Introduction

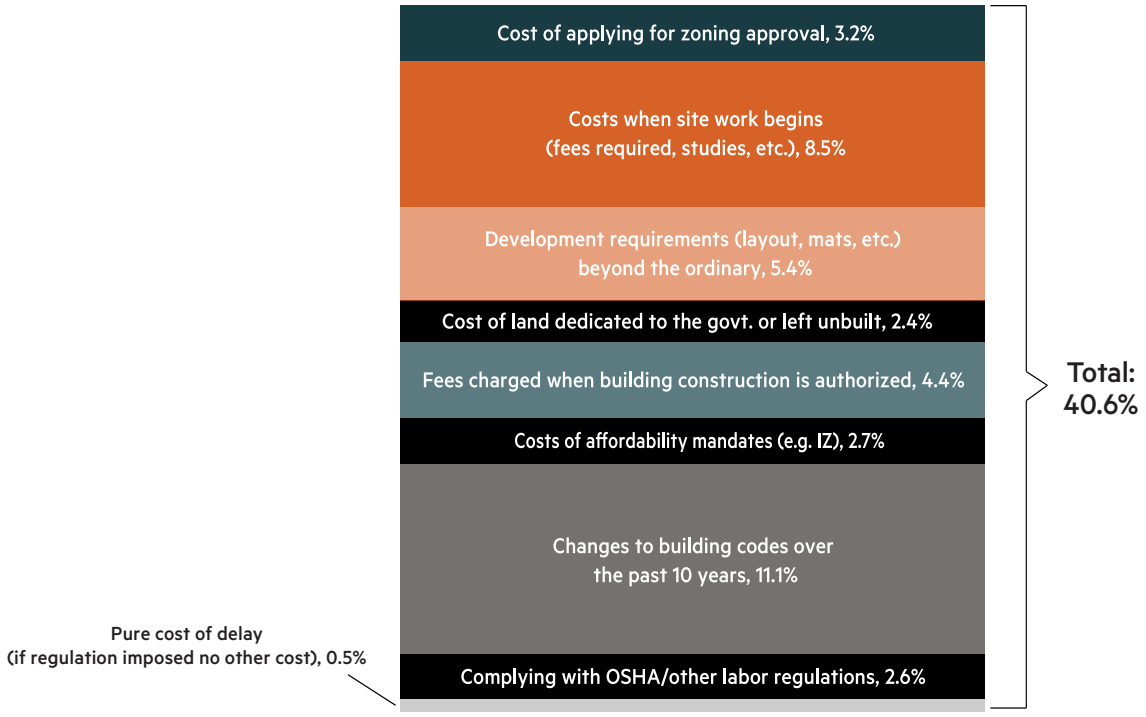
Multifamily development is subject to a variety of regulations at all levels of government. While some of these regulations are necessary to protect the health and safety of residents as well as the integrity of the building or community, it is informative to know the financial impact of each type of regulation, particularly in an era of widespread cost increases and worsening affordability problems for renters. Each added cost means the developer must increase rents for the project to remain financially feasible.

Regulations cover a wide-range of issues, and while they may be well-intentioned, the costs and burdens of any regulation must be carefully weighed against the benefits. Few would argue, for example, that basic safety standards for structures and workers are unnecessary. But, when regulation constitutes an average of 40.6 percent of a project's development costs, this raises questions about how thoroughly governments are considering the consequences of their actions. Are they aware of how much regulation currently exists? Do they realize how multiple regulations with conflicting standards can cause delays and increase costs? And do they understand the extent to which these increased costs translate into higher rents and make it difficult to build new housing that families with modest incomes can afford?

Recently, the National Association of Home Builders (NAHB) and the National Multifamily Housing Council (NMHC) undertook a joint research effort to find out how much government regulation adds to the cost of building new multifamily housing via a survey distributed to multifamily developers. (See Appendix 2).

The research finds that an average of **40.6 percent of total development costs** can now be attributed to complying with regulations imposed by all levels of government. Figure 1 shows how this percentage breaks down among the various types of regulation.

Figure 1. Average Cost of Regulation as a Percent of Total Multifamily Development Cost



Source: NAHB and NMHC

Perhaps more importantly, some of these regulatory mandates can discourage developers from building in the very marketplaces that have the greatest need for more housing. This can prove to be particularly burdensome in a world of rising costs. For example, 47.9 percent of multifamily developers said they avoid building in jurisdictions with policies such as inclusionary zoning, and a full 87.5 percent will avoid building in a jurisdiction with rent control in place.

There are also significant obstacles to development at the community level that are unrelated to governmental regulation. For instance, our research shows that "Not in My Backyard" (NIMBY) opposition to multifamily development adds an average of **5.6 percent to total development costs** and delays the delivery of new housing by an average of **7.4 months**. While most Americans agree that we need more housing and more housing affordable to middle-income households, too many change their opinion when someone proposes to put that new housing in their neighborhood. The intensity of opposition is escalated if that housing is rental housing.

About the Research

NAHB and NMHC distributed an identical survey in April 2022 to their respective memberships to access a wide range of development scales across the United States. The primary purpose was to quantify how much regulation exists for developers to contend with and how much that regulation is adding to the cost of developing new multifamily properties.

Some of these questions quantify the impact of regulations, such as inclusionary zoning and rent control, that not only may directly increase the costs of projects that are built but affect the supply and cost of housing in the community by causing some projects not to be built at all. An additional set of questions asked about the financial impact of NIMBYism, an issue that has been widely identified as one of the major cost drivers impacting affordability but where little quantifiable data currently exists.

A total of 49 usable responses were received. The responses from the survey were combined with existing public data and other survey collections to calculate the financial cost as a percent of total development cost for each regulation. A detailed description of the assumptions used in the calculations can be found in Appendix 1.

Total Cost of Regulations

Regulatory costs that exist during the multifamily development process can be divided into several categories. Table 1 shows the share of developer respondents subject to these various regulations and the average cost of each category as a percentage of the total development cost.

Table 1. Average Regulatory Costs as a Share of Total Multifamily Development

	Share With the Regulatory Cost	Regulation as a Percent of Total Development Cost	
		Average When Present*	Average Across All Properties
Cost of applying for zoning approval	93.9%	3.4%	3.2%
Costs when site work begins (fees, required studies, etc.)	98.0%	8.7%	8.5%
Dev. requirements (layout, mats, etc.) beyond the ordinary	91.8%	5.8%	5.4%
Cost of land dedicated to the goverment or left unbuilt	51.0%	4.7%	2.4%
Fees charged when building construction is authorized	95.9%	4.6%	4.4%
Costs of affordability mandates (e.g., inclusionary zoning)	38.8%	6.9%	2.7%
Changes to building codes over the past 10 years	100.0%	11.1%	11.1%
Complying with OSHA/other labor regulations	93.9%	2.7%	2.6%
Pure cost of delay (if regulation imposed no other cost)	95.9%	0.5%	0.5%
TOTAL COST OF REGULATION	**100.0%**	**40.6%**	**40.6%**

* The base is different for every percentage in this column, so the line items are not additive.

Source: NAHB and NMHC

Understanding Table 1

The last column of the table shows the averages across all multifamily developments in the survey, even those not subject to a particular type of regulation (i.e., the "zeroes" are averaged in). The column to the left of that shows average costs calculated ***only*** for those properties that ***are*** subject to the regulation.

Note that because each percentage in the "Average When Present" column is calculated for a different set of properties, the rows in that column do not add up to the total. The primary reason for including this column is so readers interested in the comparatively uncommon regulations—such as requiring developers to leave some of their land unbuilt and affordability mandates such as inclusionary zoning—can see how costly these regulations tend to be when they are present.

The other categories of regulation in the table are widespread (impacting over 90 percent of multifamily developers). For them, the differences between the "Average When Present" and "Average Across All Properties" columns are negligible.

As Table 1 indicates, the highest average regulatory cost is the result of changes to building codes over the past 10 years (11.1 percent of total development costs). The second highest are the costs imposed when site work begins (8.7 percent). The lowest average cost impact was the pure financial cost of delay, consisting of 0.5 percent when present, lower than the average cost of complying with Occupational Safety and Health Administration (OSHA) or other labor regulations (2.7 percent when present).

The first significant interaction between a multifamily developer and the government typically occurs when the developer applies for zoning approval to allow multifamily housing to be built on a particular parcel of land. Regulatory costs at this stage can vary from costs associated with fees owed to the local jurisdiction for proceeding through the approval process to market or environmental impact studies that must be commissioned from private consultants.

In some cases, a developer can acquire land that allows for multifamily structures to be built on it without requiring rezoning or a special exemption. However, this is rare, with 93.9 percent of the respondents indicating that they must dedicate resources to rezone the land to allow multifamily construction. When they exist, these costs average 3.4 percent of the total development cost.

Once site work begins, local jurisdictions often require a variety of fees or other studies. Examples of fees could include impact fees (fees charged only on a new development to be used for capital improvements) or utility impact fees. Almost all respondents (98.0 percent) reported paying some of these costs in their typical project, representing an average of 8.7 percent of total development costs when present.

Most respondents (91.8 percent) were also required by their local jurisdiction to include certain design features in their project design that go beyond what they would ordinarily include. Examples include energy-efficiency upgrades or specific design requirements for facades. When present, complying with these requirements amounted to an average of 5.8 percent of total development costs.

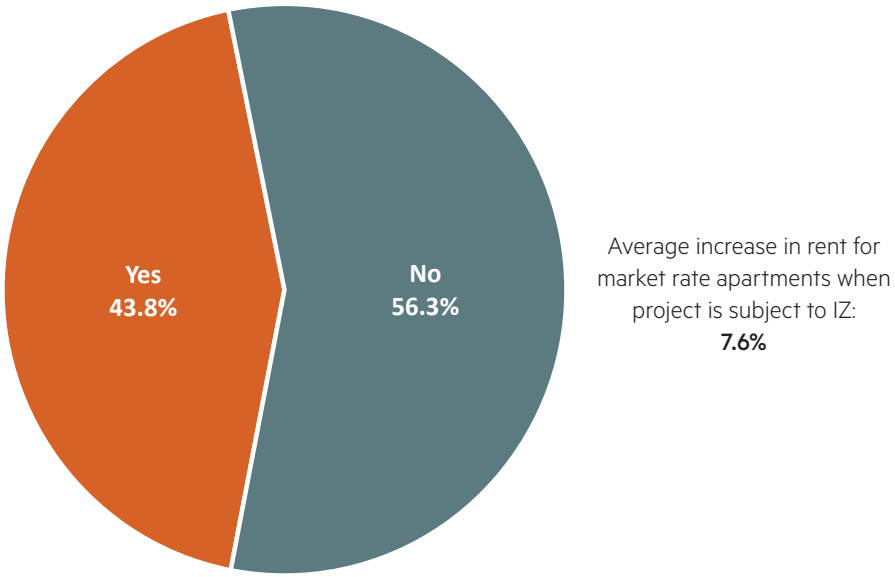
Governments can also require developers to leave a portion of the development site dedicated for government use or left unbuilt. This requirement reduces the amount of developable area, which means the revenue from that area is lost and must either be absorbed or made up for elsewhere. This requirement was present for approximately half (51.0 percent) of respondents; when present, it represented an average of 4.7 percent of total development costs.

Jurisdictions also often charge fees when site work is completed to authorize building construction. Examples of these costs include a fee when filing for a building permit or fees for additional utility hook-ups. Almost all respondents (95.9 percent) reported paying some sort of fee at this phase of development, with an average cost of 4.6 percent of total development cost when present.

Local affordability mandates are another important cost driver. These mandates are designed to increase the supply of affordable apartments. A common example is inclusionary zoning, where developers must offer a certain percentage of apartments at below-market rent levels. In many cases, a density bonus is provided to developers, which allows them to include more units in their project than ordinarily permitted by zoning to offset those lowered rents.

Unfortunately, these incentives are often inadequate and do not fully cover the lost rental revenue. In those cases, developers are forced to raise rents on the unrestricted apartments to fill the gap or to abandon the project altogether because it is no longer financially feasible.[1] These mandates were present in slightly over one-third (38.8 percent) of respondents' typical projects, and when present, they made up an average of 6.9 percent of total development costs (Figure 2). Respondents subject to inclusionary zoning report having to raise rents by an average of 7.6 percent.

Figure 2. Is Respondent's Typical Project in a Jurisdiction with Inclusionary Zoning? (Percent of Respondents)



Source: NAHB and NMHC

[1] NAHB has developed an Inclusionary Zoning Calculator Tool to help developers and local jurisdictions determine if incentives are adequate to allow a project to be built.

The increase in costs to comply with changes to building codes over the past 10 years was the largest driver of development cost, amounting to 11.1 percent of total development costs.

Most jurisdictions have been adopting, revising and enforcing building codes for decades, and an entire industry has emerged supporting and encouraging changes to existing building codes. While building codes play an important role in protecting resident safety and building integrity, they have evolved well beyond their original purpose and now are also used to promote public policies like energy efficiency and sustainability.

Building code development and adoption are complex, and it is essential to consider impacts to housing affordability throughout the process. State and local jurisdictions adopt and enforce building codes, but federal policymakers are also active in the development of international model codes, and they promote the adoption of certain code editions. For example, the U.S. Department of Energy encourages states to adopt the most stringent versions of the model energy codes. Various policy groups, industry organizations and individual companies also advocate for code changes that promote specific goals. These changes do not always balance the needs of housing affordability and have the potential to drive up construction costs[2] without improving building safety or integrity.

Developers are also subject to complying with Occupational Safety and Health Administration (OSHA) requirements and other labor regulations throughout the development process. While measures to protect the safety and health of construction workers are essential, NAHB has argued that some OSHA policies, like applying its beryllium standards to residential construction, simply drive construction costs up without impacting health or safety.

Fully 93.9 percent of respondents said they had to comply with these regulations and that they added 2.7 percent to total development costs.

Almost all respondents (95.9 percent) also reported that complying with regulations caused some sort of delay for their typical project. We estimate that "pure" cost of delay—the financial cost that taking the time to comply with that regulation would incur—would be an average of 0.5 percent of total development costs. This may not seem like a substantial number, but in an era of rising costs and diminishing affordability, any additional cost can impact project feasibility.

Affordability Mandates and Neighborhood Opposition Can Discourage Development Altogether

Aside from increasing development costs, some regulations and restrictions can impact whether development even occurs, which is incredibly harmful given the nation's shortage of housing.

There are many factors a developer considers when choosing a potential site for a future development; primary among them is the market demand for the proposed units. Increasingly, however, developers are also forced to consider whether their chosen jurisdiction imposes affordability mandates on new development. Two of the most popular mandates are inclusionary zoning and rent control because they are wrongly deemed to be "quick and free" fixes to housing affordability challenges.

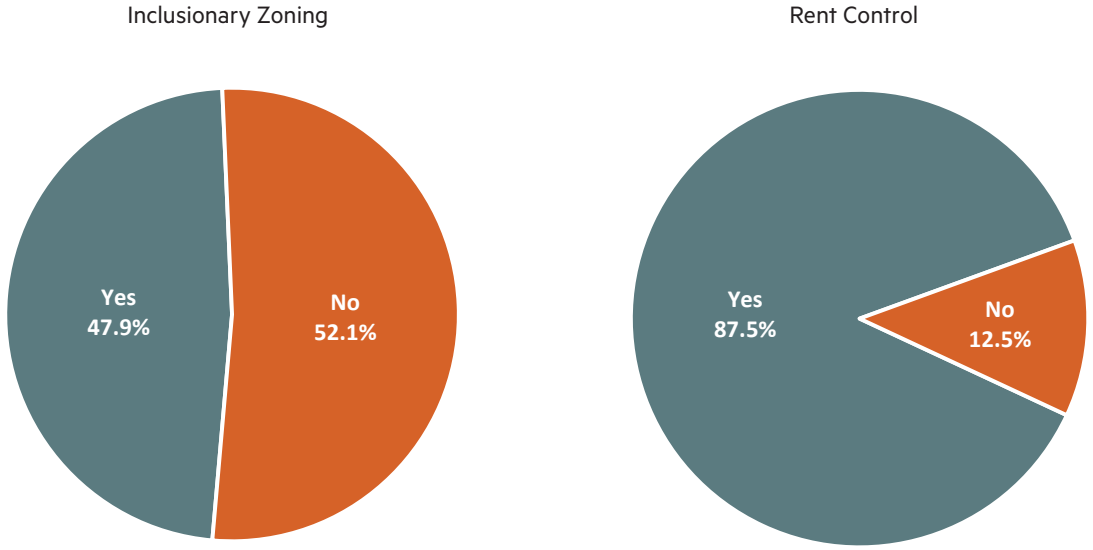
[2] NAHB's subsidiary Home Innovation Research Labs has recently produced a report showing that codes adopted in 2018 increase construction costs for standard types of multifamily buildings between $2,500 and $25,000.

Research has shown, however, that these quick fixes, particularly rent control, have many pitfalls. One major pitfall of both, as shown in Figure 3, is that it can deter development completely. Almost half of the respondents (47.9 percent) reported that they avoid building in jurisdictions with inclusionary zoning policies. The response was more acute for rent control—the overwhelming majority of respondents (87.5 percent) reported they avoid building in jurisdictions where rent control is present.

In fact, these mandates can impact the financial feasibility of a project, both in the short-term and long term. As a result, developers may simply choose to avoid jurisdictions with these mandates because of the difficulty in making a project pencil out.

Rent control regulations similarly differ depending on the local jurisdiction. In its basic form, rent control is a restriction on how much a property owner can raise a resident's rent, ignoring market conditions. Some rent control laws exempt new construction from price controls, and others institute a cap on how much an owner can raise a resident's rent, often tied to the Consumer Price Index (CPI).

Figure 3. Do Multifamily Developers Avoid Building in Jurisdictions with Certain Policies? (Percent Of Respondents)

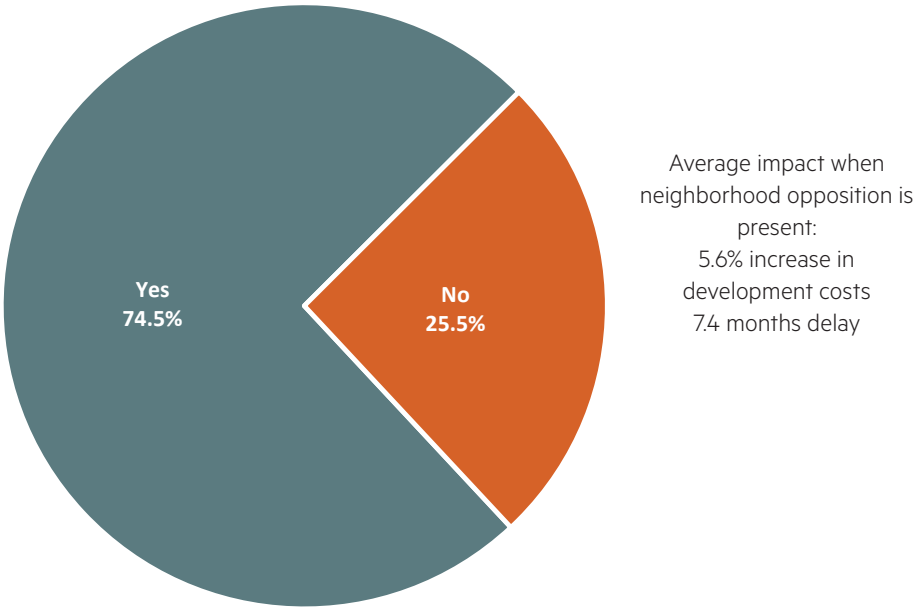


Source: NAHB and NMHC

Another major impediment to whether a project gets built can be neighborhood opposition. Opposition against multifamily development by current residents, commonly referred to as "Not in My Backyard" (NIMBY) opposition, can take many different forms. Residents may fight against rezoning attempts or may even file lawsuits to attempt to prevent development from occurring. Approximately three-quarters (74.5 percent) of respondents reported encountering neighborhood opposition to multifamily construction (Figure 4). The resources required to overcome this opposition add an average 5.6 percent increase in development costs when present. They also delay the development timeline by an

average of 7.4 months.

Figure 4. Have Developers Encountered Neighborhood Opposition To Multifamily Construction? (Percent Of Respondents)



Source: NAHB and NMHC

Conclusion

As the above discussion has demonstrated, multifamily development can be subject to many regulatory costs, including a broad range of fees, standards and other requirements imposed at different stages of the development and construction process. Because of this, it may not be surprising that regulation imposed by all levels of government accounts for 40.6 percent of multifamily development costs on average.

This research was solely restricted to the impact of regulations on total development costs. It is important to note that developers are also dealing with rapidly rising land, material, and labor costs. Combined, these costs make it virtually impossible for private sector developers to deliver housing at a price point that many working Americans can afford.

When multifamily development costs rise, it unavoidably translates to higher rents and reduced rental housing affordability. Multifamily developers cannot secure financing to build their projects unless they can demonstrate to lenders that the rents will be sufficient to cover costs and pay off the loans.

The purpose of this report is not to argue that all regulation is bad and should be eliminated, but that some of these regulations are likely duplicative as multiple levels of government impose regulations on the same project. In addition, many of these regulations do not have a relationship to resident safety or building integrity.

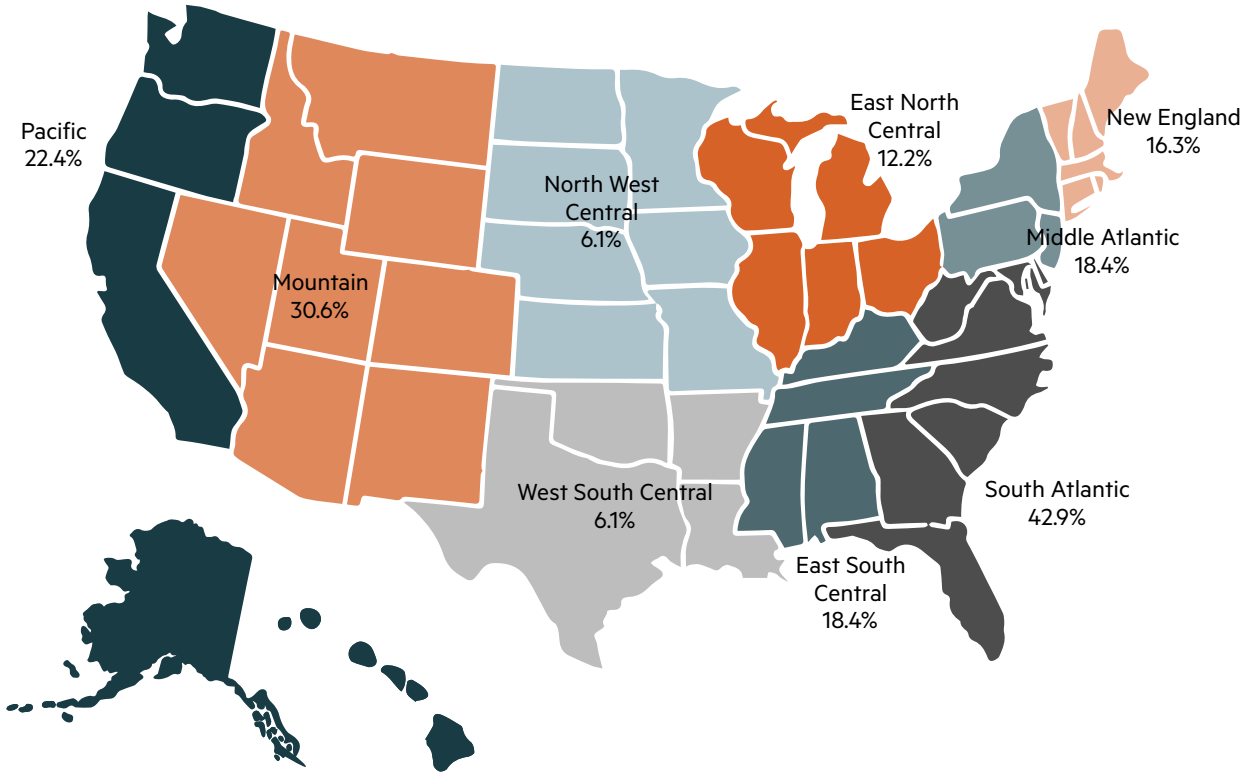
The research aims to raise awareness of how much regulation currently exists, how much it costs and to encourage governments to do a thorough job of considering the implications for housing affordability when proposing and implementing new directives. It is also to help inform local leaders that they also have the power to waive some of these duplicative costs, thus lowering the rent required for the project to remain financially feasible and improving affordability.

Respondent Profile

A total of 49 usable responses were received from multifamily developers, with a slightly higher concentration of NAHB members than NMHC members (and no duplicates). In one instance, two survey responses were accepted from one member company because the respondents represented different geographic areas.

All geographic areas in the United States were represented (see Figure 5). Respondents were able to choose more than one region of operation. The South Atlantic region (DE, DC, FL, GA, MD, NC, SC, VA, WV) had the largest representation, with 42.9 percent of respondents operating there, followed by the Mountain region (AZ, CO, ID, NM, MT, UT, NV, WY) with 30.6 percent and the Pacific region (AK, CA, HI, OR, WA) with 22.4 percent. The West North Central (IA, KS, MN, MO, NE, ND, SD) and West South Central (AR, LA, OK, TX) had the lowest representation at 6.1 percent of respondents each.

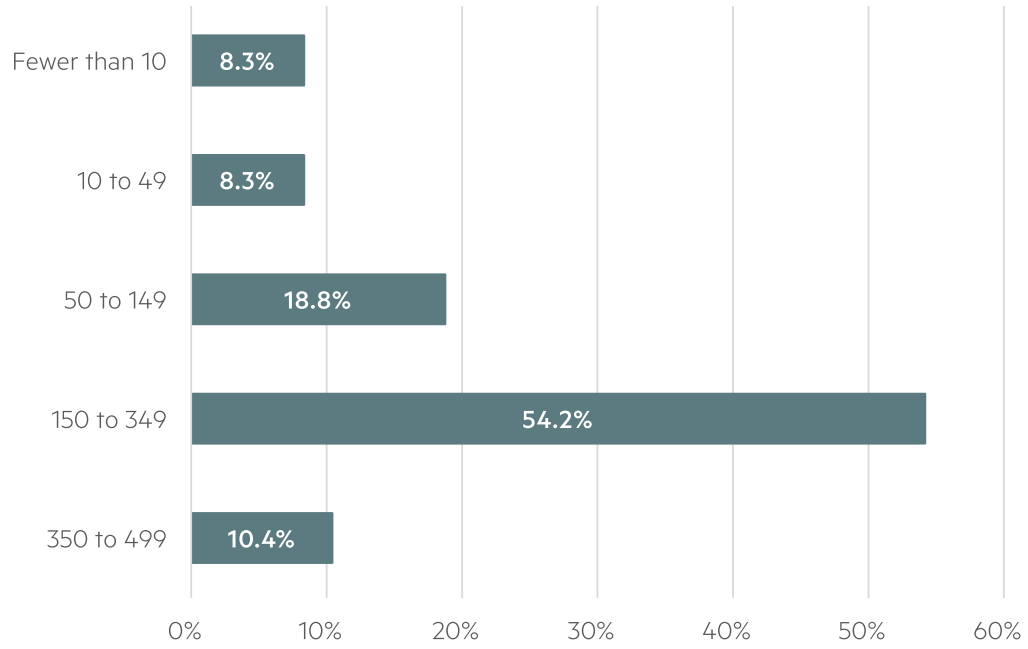
Figure 5. Share of Respondents Who Build in Each of the Nine Census Divisions



Source: NAHB and NMHC; U.S. Census Bureau

The respondents' typical project size varied widely: from fewer than 10 units to 499 (see Figure 6). The majority of respondents (54.2 percent) reported a typical project size of 150 to 349 units. Note that this is project size, not building size, meaning that each category could comprise both garden-style communities, which frequently have units spread across multiple buildings, as well as high-rise buildings, where all units are traditionally in one building.

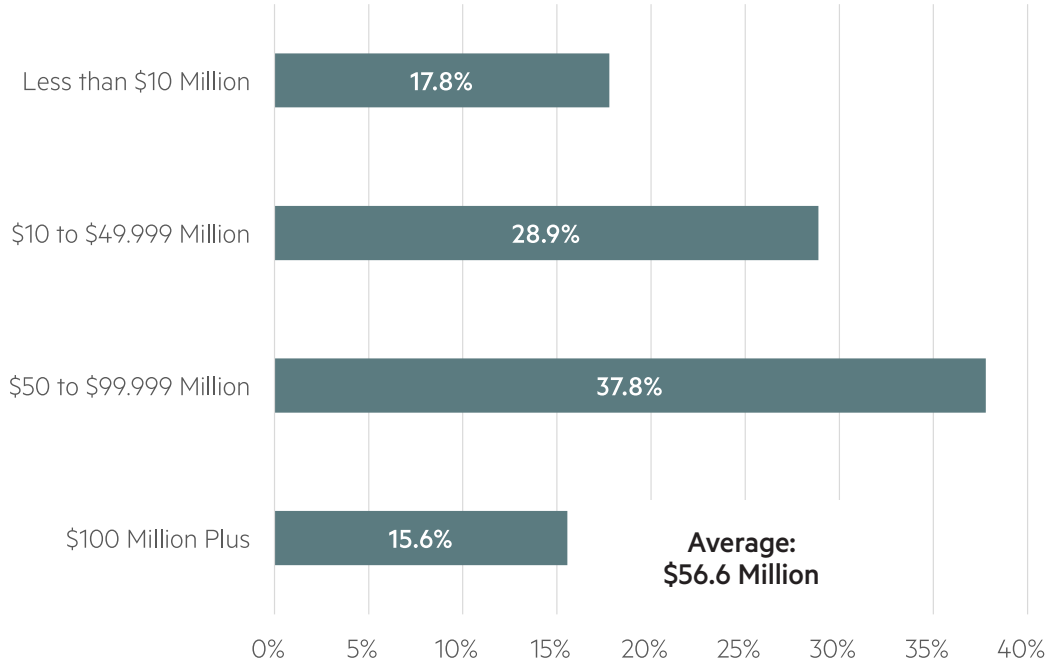
Figure 6. Number of Apartments in Respondent's Typical Project (Percent of Respondents)



Source: NAHB and NMHC

The typical total development cost varied as well but was slightly more evenly distributed (Figure 7). The average total development cost of respondents for a typical project was $53.6 million. Barely over one-third (37.6 percent) reported a typical development cost of $50 to $99.99 million. Small and large projects were equally represented, with 17.8 percent of respondents reporting a cost of less than $10 million and 15.6 percent indicating the typical project costs at least $100 million.

Figure 7. Total Development Costs for Respondent's Typical Project (Percent of Respondents)



Source: NAHB and NMHC

Appendix 1: Assumptions Used in the Calculations

To calculate a final effect on development costs, many of the NAHB-NMHC survey responses need to be combined with additional information. Primarily these are assumptions about the terms of development and construction loans, how long construction typically takes, and how to allocate costs to different stages of the development and construction process. This appendix lists all the assumptions used in the calculations and gives the sources for each.

Loan Terms

1. 1 point charged for all land acquisition, development, and construction (AD&C) loans, based on results from a Quarterly Finance Survey (QFS) that NAHB was conducting in the early to mid-2000s.

A 7.65 percent interest rate on all AD&C loans. The QFS indicates that rates are typically set one point above prime, and 6.65 percent is NAHB's estimate of the prime rate that would prevail in the long run under neutral Federal Reserve policy.

The estimates also assume that three-fourths of any category of costs are financed, based on typical AD&C loan-to-value ratios in the QFS.

Construction Lags

The source for information lags not directly collected in the NAHB-NMHC questionnaire is the Survey of Construction, conducted by the Census Bureau and partially funded by the Department of Housing and Urban Development.

Preliminary estimates are taken from the published annual tables, averaged over the 2001-2016 period:
Authorization to start = 1.71 months
Start to completion = 10.87 months

If the project is 5-9 units
- Authorization to start = 1.95 months
- Start to completion = 11.64 months

If the project is 10+ units
- Authorization to start = 1.94 months
- Start to completion = 13.21 months

The NAHB-NMHC survey collected data on how much time regulation adds to the development process. To assign this to a particular phase of the development, the following assumptions are used.

The regulatory delay is split and attributed half to the lag between applying for zoning approval and the beginning of site work and half to the period after site work begins. If half of the regulatory delay exceeds the lag between applying for approval and the beginning of site work, the excess is also attributed to the period after site work begins.

It is first assumed that the resulting regulatory delay is attributable to the period between the start of site work and the start of building construction, minus three months (the assumed minimum time it would take to do site work in the absence

of regulation, based on conversations with developers). If any regulatory delay remains after being allocated to the zoning approval and site work periods, it is then attributed to the building construction period, and the start-to-completion lag is adjusted upward beyond the SOC-based average, accordingly.

The analysis assumes all loans are paid off when the buildings are completed.

Cost Breakdown

To implement the process described in the paragraph above and calculate a "pure" cost of delay (i.e., the effect regulatory delay would have even if the regulation imposed no other cost), estimates of costs incurred during different phases of the development process are needed.

The breakdown is based on the split between lot and construction costs in NAHB's Construction Cost Surveys (averaged over surveys conducted since 2000) and the Census Bureau's "non-construction cost factor" for raw land. The calculations also assume three-fourths of these costs are financed, based on typical AD&C loan-to-value rations in the QFS.

Resulting assumptions:

- Only the cost of applying for zoning occurs at the very start of the development process. Financing costs associated with this are charged to the regulatory cost of the application and not counted in the pure cost of delay.
- 10.2 percent of total development represents costs financed by a land acquisition loan at the start of the site work phase.
- 10.8 percent of total development costs represent costs financed by a development loan during the site work phase, assuming draws on the loan occur on average halfway through this phase.
- 54.0 percent of total development costs represent costs incurred after building construction has started and financed with a construction loan, again assuming draws on the loan occur on average halfway through the site work phase.

Appendix 2: Survey Questionnaire

1. **What regions do you build in? Please select all that apply.**
   - New England (CT, ME, MA, NH, RI, VT)
   - Mid Atlantic (NJ, NY, PA)
   - South Atlantic (DE, DC, FL, GA, MD, NC, SC, VA, WV)
   - East North Central (IN, IL, MI, OH, WI)
   - West North Central (IA, KS, MN, MO, NE, ND, SD)
   - East South Central (AL, KY, MS, TN)
   - West South Central (AR, LA, OK, TX)
   - Mountain (AZ, CO, ID, NM, MT, UT, NV, WY)
   - Pacific (AK, CA, HI, OR, WA)

2. **How many units does your typical multifamily project have?**
   - 2-4 Units
   - 5-9
   - 10-49
   - 50-149
   - 150-349
   - 350-499
   - 500 units or more

3. **What is the total dollar amount spent on development costs in your typical project?**

   $_____

4. **For a typical piece of land, how much does it cost to apply for zoning approval as a % of total development cost?** *(Include costs of fiscal or traffic impact or other studies and any review or other fees that must be paid by the time of application. Please enter "0" if application costs are Zero percent).*

   _____%

5. **For a typical project, how many months does it take between the time you apply for zoning approval and the time you begin site work?**

   _____months

6. **How much does it cost to comply with regulations when site work begins, as a % of total development costs?** *(Include costs of complying with environmental or other regulations as well as the cost of hook-up or impact or other fees.) Please enter "0" if cost of complying with these regulations is Zero percent.*

   _____%

7. **How much do development requirements that go beyond what you would otherwise do (in terms of property layout, landscaping, materials used on building facades, etc.) add to your cost as a % of total development costs?** *(Please enter "0" if the jurisdiction's requirements don't go beyond what you would normally do.)*

   _____%

8. **In the typical case, what is the value of any land that must be dedicated to the local government or otherwise left unbuilt (for parks, open green space, etc.) as a % of total development cost?** *(Please enter ")" if dedicating land is required infrequently.)*

   _____%

9. **How many months does it take between the time you begin site work and the time you obtain authorization to begin construction of the apartment building(s)?**

   _____months

10. **How much extra time (in months) overall does complying with regulations add to the development process?** *(Please enter "0" if regulations typically cause no delay).*

    _____months

11. **When you obtain authorization to begin construction, how much do you pay in additional fees as a % of total development costs? In many cases, this will be only a permit fee but include any additional impact or hook-up or inspection fees if they kick in at this time.** *(Please enter "0" if fees paid during or after construction are Zero percent).*

    _____%

12a. In the typical case, does a jurisdiction have inclusionary zoning/affordable housing requirements that apply to your project?

- o Yes
- o No

12b. *[If the answer to 12a is "yes"].* **In the typical case, how much do these requirements (or a fee in lieu of affordable housing) cost as a % of total development cost?** *(Please enter "0" if inclusionary zoning/affordable housing mandates/fees in lieu of affordable housing are encountered infrequently).*

_____%

12c. *[If the answer to 12a is "yes"].* **In the typical case, how much do these additional requirements raise the rents of market-rate units?**

_____%

13. **Do you typically avoid building in a jurisdiction if it has an inclusionary zoning requirement?**
    - o Yes
    - o No

14. **Do you typically avoid building in a jurisdiction that has rent control?**
    - o Yes
    - o No

15. **Over the past 10 years, how much have changes in construction codes and standards added to the cost of building a typical multifamily project as a % of total development costs?** *(Please enter "0" if code changes have had minimal impact on costs).*

    _____%

    - Please select if you have not been in operation for the past 10 years

16. **How much does complying with OSHA or other labor regulations cost, as a % of total development cost?** *(Please enter "0" if labor regulations have no impact on development costs).*

    _____%

17. **Have you experienced added costs or delays due to neighborhood opposition to multifamily construction?**
    - Yes
    - No

18. **In the typical case, how much costs are added to a project due to neighborhood opposition to multifamily development as a % of total development costs?**

    _____%

19. **In a typical case, how much extra time (in months) does it take to address neighborhood opposition to multifamily development?**

    _____months

20. **Comments:**

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ICC MEMORANDUM

TO: Energy Code Development Committees, Subcommittees and Interested Parties
FROM: Mike Pfeiffer, PE, Senior Vice President of Technical Services
RE: Discount Rates and Code Content
DATE: February 15, 2022

The Code Council appreciates the considerable effort to date by members of the Commercial and Residential Consensus Committees, Subcommittees and interested parties to develop the 2024 International Energy Conservation Code and Chapter 11 of the International Residential Code under a standards development process. We are aware of two issues before the committees which if not resolved expeditiously may lead to an inability to complete the Committees' work in a timely manner. This memorandum provides direction to the committees on the use of discount rates in cost effective analysis and the placement of code content in the IECC and IRC, as applicable.

Discount Rates:

In the framework and subsequent committee procedures issued by the Code Council Board of Directors, the procedures for use of cost effectiveness analysis are provided. Per these procedures, "underlying assumptions should be clearly documented including compliance with any parameters set by the committees and approved by the Board." Groups tasked by the committees to develop parameters have successfully reached consensus on many of the items. However, agreement on the discount rate(s) to be used has not been reached to date.

The direction below points to discount rates set by the U.S. Office of Management and Budget (OMB) for use in analysis conducted by federal agencies (including the U.S. Department of Energy). These rates are currently used to support the statutory review DOE conducts upon release of a new edition of the IECC. Cost effectiveness analysis is an important tool for use by the committee in determining the resolution of a proposal. It is up to individual committee members and the Consensus Committees to determine the weight they place on results of a cost effectiveness analysis as it relates to the action taken on the proposals for which cost effectiveness is a consideration.

The Code Council provides the following direction:

> *Consistent with guidance from the U.S. Office of Management and Budget (Circular A-4) the Committees shall conduct cost effectiveness analysis using discount rates of both 3 percent and 7 percent for evaluation of the public input proposals currently under consideration. If OMB revises these rates prior to the posting of Public Comment Draft 1 for comment, the updated discount rates will be used for those comments.*

Code Content:

In the new framework approved by the Board in March 2021, a new scope and intent were developed for the IECC and Chapter 11 of the IRC. While this new scope and intent is considerably more detailed than the prior scope and intent, there is some confusion within the Committees on what topics can be addressed within the body of the IECC or IRC Chapter 11 as minimum requirements as opposed to an IECC or IRC appendix.

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The scope and intent of ICC codes and standards are set by the Board of Directors in accordance with Council Policy 28. The Board has not previously provided updates or clarification to the scope or intent of codes or standards during an active development process, allowing the development process to proceed to resolution. If a topic is contained in the scope or intent statement, it may be included either in the base of the code or as an appendix, as determined by the consensus body. Generally, appendices in the I-Codes fall under one of two categories: available for state/local adoption and for informational purposes only. In both cases, they undergo the rigors of the process no differently than text considered for the minimum requirements in the code. Each appendix in the respective I-Code notes the specific application of the appendix.

The Code Council provides the following direction:

> *Any content within the scope and intent of the code may be included either in the body of the code as minimum requirements or as an adoptable appendix based on the determination of the responsible Consensus Committee. Where content is to be included in an adoptable appendix, the appendix must include mandatory enforceable language.*

Cc: Dominic Sims, CEO